# CURRENT SCIENCE

Vol. VII] November 1938 [No. 5



## "Spiritual Disarmament."

IF the Founder of Christian Religion were to reappear in Palestine or Central Europe, who can describe his feelings of shame and sorrow at the transformation of the "image of God" into a cross between Moloch and Puck. Human nature being the same all the world over, Eastern Asia is emulating the excesses of Europe. Even at the risk of provoking the laughter of the political Pharisees and the Aryán scribes, we reproduce below the canons of human relationship propounded by Him whose Church still nominally claims the allegiance of white civilization.

"You have heard that it was said by them of old time, Thou shalt not kill; and whosoever shall kill shall be in danger of the judgment: but I say unto you, That whosoever is angry with his brother without a cause shall be in danger of the judgment: and whosoever shall say to his brother, Raca, shall be in danger of the council: but whosoever shall say, Thou fool, shall be in danger of hell fire. Therefore if thou bring thy gift to the altar, and there rememberest that thy brother hath ought against thee; leave there thy gift before the altar, and go thy way; first be reconciled to thy brother, and then come and offer thy gift."

The spirit of the Lord must have been upon Herr Hitler, when he pronounced the beautiful phrase, "Spiritual Disarmament" which is an excellent summary of the above sermon. But we know that neither democrats nor dictators are the modern representatives of this immaculate spirit, and their eyes, instead of being turned to the heavens, are fixed on armaments as the only argument of peace. What is most disconcerting is that the religion of the Church and the culture of the philosopher alike never wore white gloves for moderating and assuaging the influence of the primitive passions of their followers. It might almost seem true that both religion and culture as understood or as misunderstood, have a banality and inward dryness which are irremediable sins in the eyes of grace. As an element making for proportion, harmony and taste, culture is individualistic; as a basis of sacrifice, service and love, religion is equally individualistic. Their universal character though taught and defended by the scholar and the saint through centuries, is entirely static and fugitive, to which history bears ample evidence. Under

the impact of the dynamic forces of material progress, religion and culture seem powerless, and lose their natural predilection for the reasonable processes of compromise and arbitration as against the more summary decisions by force of arms.

In the language of modern imperialism which resorts to violence and warfare for spreading the new gospel of civilization, the boisterous phrases "racial equality", "cultural freedom" and "international justice" are simply unmitigated cant. It will be remembered that the League of Nations, which was to act as the fountain and source of international peace and harmony, refused, under the threat of the withdrawal of some of its original members, to accept the principle of racial equality as an underlying factor in the preamble of the Covenant of the League. If the original powers could guarantee the administration of racial justice in an absolutely impartial spirit, where is the objection to the full and unconditional affirmation of racial equality. This mental reservation is undoubtedly the cause of all the fearful developments with which modern statesmen are confronted, and once we grant racial and cultural superiority on the part of certain groups of people, it is only natural to expect that this superiority must express itself in aggressiveness. People have implicit faith in the egregiously false doctrine that superiority of culture is synonymous with superiority of physical power, and the logical conclusion of such facile acquiescence is the robust philosophy that superiority must supplant inferiority throughout the habitable globe. But culture and religion never possessed the large-hearted peaceable quality which legend associates with them, but, on the other hand, becoming subordinate to the dominating influence of politics, they have been accessory to bloodshed. Theoretically man is prepared to be bound to his God, but he prefers in all his activities to be divided from his fellow beings. Universal brotherhood of man is an abstract philosophic conception, and as an article of faith in the practical affairs of the world, it was found unworkable. We know that religion and culture always range themselves readily and whole-heartedly on the side of political power, when engaged in international conflicts which they bless and justify, though they may have ceased to be their direct provocative cause.

Can religion and culture be made a potent factor for peace? The answer to this question is "Yes, if we have a new religion and a new culture, not the bedraggled old ones". When Herr Hitler spoke of "spiritual disarmament", we thought that under the inspiration of a great apocalypse such as St. John witnessed in Patmos, he was on the threshold of propounding a new religion for his countrymen and through them to the world. But instead of wearing the Marriage Garment which according to the Presbyterian teacher, Solsgrace, typified inward purity, and instead of preventing the unhappy incidents from being perpetrated in Berlin and Munich, he has deliberately permitted these unworthy and unchristian acts to add a stroke to the fourth letter of his name. No body will regret more than his own ardent admirers that their great leader, with the indomitable soul of the elder Cato, should be immortalised in history by this outrageous supplement, while he had a fair chance of being classified with the blessed saints, if by his actions be had acquired the appellation of "Healer". What visions are opened out before our mind's eye by the phrase "Spiritual Disarmament"? Love, faith, hope, joy, peace and work. Hatred, greed, jealousy, passion and fear banished once and for all. Nations all the world over turning a new way of life. Brotherhood of man, service and sacrifice for fellow beings. Truth and non-resistance in the place of secret alliances and militarism. Fight against the evil of the spirit, not against the neighbour.

These and good many other things are contained in all the religious works of the world. What is it that has made them defunct, will they at any time become the active principles of the life of nations and of individuals? Is armament the necessary prelude for the reinstatement of peace? We are not appalled by the "race of armaments" for we are convinced that a point must be sooner than later reached, when the very deadliness of the weapons will make war eventually impossible. It is not improbable that science may still perfect such unthinkably terrible engines of war. Perhaps nations may then decide to bury them in the oceans, and evolve other solutions for mutual concord and world-wide peace. It is too premature to talk of "Spiritual Disarmament", when our hearts and hands are still unclean.

## International Auxiliary Language.

INVENTIONS over inventions bringing peoples closer together like the telegraph, telephone, radio, aeroplane, television are being continuously perfected and yet very little attention is given to an invention which when adopted will give mankind the proper means for free communication. A common language is the one great invention that is needed to crown all others and give them their full value.

The advantages of such an International Auxiliary Language seems to be evident. International Meetings are made very difficult by the diversity of languages, there is great loss of time, confusion brought about by the necessity of using several languages, of translating from one to others. The selection of delegates is in many cases limited to those who know the official languages of the meeting.

Once such an International Auxiliary Language has been established these difficulties would disappear. Its study could be introduced even in the elementary schools. Much of the time now devoted to several languages might be given to the international language or to other subjects by most of the pupils who do not go in for philological studies. Translations might be reduced to one in the international language, and papers on subjects which have a limited number of specialists might be written outright in the International language with saving in time and expense and many other advantages.

The adoption of a natural language would meet with opposition on the part of all countries, especially the largest of another mother-tongue. Besides the learning of a natural language always requires long years of intensive study. At different times various languages have had successively a predominant position : Greek, Latin, Arabic, Italian, Spanish, French and now English. All these gave way except for English which seems at present to be dominant. But what will be its position in a few decades from now in the face of the growth of Russian, Chinese, Spanish, or some of the Indian languages, Portuguese ?

Therefore, most people interested in the question suggested artificial languages. In reality, the name of artificial language is a kind of tautology, because there is art also in the coarsest language. The more so in the literary language in which conscious selection, if not arbitrary, is more or less profound, more or less recognizable, but always noteworthy. But the designation of artificial languages covers the projects of languages constructed according to a determined plan. Such a language is not meant to supersede the existing national languages ; its ambition is to serve as a mere auxiliary language ; its purpose is not to suppress diversity, but to promote co-operation.

Although many great minds have given serious thought to this question of an International Auxiliary Language, from Descartes, Leibniz, Delgarno and Wilkins to Schleyer, Zamenhof, Couturat, Leau, Peano, Jespersen, many people considered this proposition as an impossible absurd task, amongst them many linguists ; but of late it seems that this opposition is breaking down (see debates at their meeting in Geneva in 1931).

At first philosophical languages were proposed, a kind of algebra of concepts which would lead to logical thinking. The first of these projects is due to Descartes. He submitted the plan of an universal language easy to learn, to pronounce and to write, which would help one's judgment representing distinctly all things so that it would be practically impossible to be mistaken. Descartes limited himself to the exposition of the project, but G. Delgarno and J. Wilkins submitted in the seventeenth century two detailed projects. Leibniz also left amongst his papers many notes relating to a philosophical language.

From these philosophical languages we go over to *a priori* schemes. In these the choice of the elements is made according to a classification, more or less strict, of the concepts. The last of these schemes is " Ro " by E. P. Foster.

From *a priori* we go on to mixed schemes. Grammar is always established *a priori*, but the vocabulary is selected from natural languages without exact criteria and with many changes due to the grammatical structure selected. Amongst these the best known is Volapük proposed by J. M. Schleyer, which was the first artificial language to obtain a wide diffusion.

After these came the *a posteriori* schemes. In these very little is arbitrary. The grammar is obtained by regularizing one of the natural languages or selecting from various

of them. The vocabulary is selected also from natural languages. Examples of these naturalistic languages are Esperanto, its modification Ido, Occidental, Interlingua or Latino sine flexione, Novial.

If the movement for an International language is followed, it will be seen that it is not the case of a multitude of projects without connection or relationship; but these projects are connected, they have a common base, a common idea. This idea as pointed out above has traversed three stages: the philosophical, the *a priori*, the mixed, and last the *a posteriori*. These last show a remarkable conformity. Their authors get away from the *a priori* basis. They adopt the principles of internationality, so that they differ less than two dialects of a natural language.

When Volapük was proposed by J. M. Schleyer in 1879–80, its followers organised at their Munich Congress of 1887 an academy called Kadem bevünetik volapüka. Its first president was M. Kerckhoffs (Paris). He was succeeded by W. Rosenberg (Leningrad) (1893–98). During the latter's term of office he began the compilation of the vocabulary of what became a new language called Idiom Neutral, decidedly naturalistic and not mixed like Volapük, but *a posteriori*. The academy changed its name to Akademi Internasional de Lingu Universal and M. A. F. Holmes (Rochester, N.Y.) became the next president (1898–1908). He was succeeded by G. Peano (Turin, Italy) who carried the *a posteriori* scheme to the limit. The Academy again changed its name to Academia pro Interlingua, and although open to partisans of any International Auxiliary Language, stands for the language created by G. Peano who had followed the suggestion of Leibniz to use for practical purposes a simplified Latin. G. Peano started to use Latino sine flexione in 1903 and since then he has worked at the international vocabulary made up of words in international usage and those of Latin still living in the neo-Latin languages and in English and others. The grammar simplified in the extreme is considered by many to have many points in common with Chinese.

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## Recent Discoveries of Fossil Algæ in the Cretaceous Rocks of S. India.

By Prof. L. Rama Rao.

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ABOUT seven years ago, the writer of this article reported through the columns of *Nature*[1] the first discovery of fossil algæ in the cretaceous rocks of India, from the Niniyur group of the Trichinopoly District (S. India).* Following up this discovery, other rocks of the Trichinopoly cretaceous area were also looked into for algal remains, and it was seen that almost every one of these, especially the limestones, also showed more or less abundant algæ. Thus within the last few years we have been able to make a large collection of fossil algæ from these and certain other beds of South India. The entire material is being studied in detail by my colleagues Messrs. C. Prasannakumar, S. R. Narayana Rao and K. Sripada Rao; in the meanwhile, it is proposed in this article to give a general account of these algæ with special reference to a few forms of outstanding stratigraphical or palæobotanical importance.

Convincing algal structures were first noticed in sections of certain nodules occurring in the limestones of the Niniyur group, and very soon it was seen that the limestones themselves also contained plenty of algæ, some of the best algal remains being noticed in the flints and cherts which are the result of the silicification of these limestones.[2] These fossil algæ from the Niniyur group were studied in collaboration with Prof. Julius Pia of Vienna, the great authority on fossil algæ, and the results published as a memoir in the Pal. Indica series of the Geological Survey of India.[3] Among these algæ from the Niniyur division are represented the following groups: (*a*) the Rhodo-

* The cretaceous rocks of the Trichinopoly Dt., S. India, range in age from the cenomanian to the danian of the standard stratigraphical scale, and are divided into four groups. Starting from the oldest these are (*a*) the Utatur, (*b*) the Trichinopoly, (*c*) the Ariyalur, and (*d*) the Niniyur.

phyceæ, represented by the Solenoporaceæ and the Corallinaceæ, (*b*) the Chlorophyceæ, represented by the Dasycladaceæ, and (*c*) the Chætophoraceæ. Of the Solenoporaceæ represented in these rocks, we have *Parachætetes asvapatii*, a new species which is seen to build up small calcareous nodules composed of several more or less broad and blunt lobes, with the tissue indicating a fairly clear differentiation into a hypothallium and a perithallium. Of the Corallinaceæ, we have only the most primitive genus *Archæolithothamnium* (belonging to the subfamily Melobesieæ), the common species being *A. lugeoni*. This species had hitherto been known only from the eocene (of Spain) and its occurrence in South India in beds of cretaceous age is therefore remarkable. A form closely similar to *A. provinciale* is also commonly noticed. A careful comparative study of the different types of *Archæolithothamnium* noticed in the Niniyur rocks brings out the important fact "that the difference between perithallium and medullary hypothallium, between protuberances and branches, is not a fundamental one in *Archæolithothamnium*. This seems to be one of the primitive characters of the genus". The Dasycladaceæ, though present only in a few sections, are of special interest from the palæobotanical point of view. Here we have a new form *Dissocladella savitriæ* which is very well preserved, and is perhaps the most complete *Dissocladella* yet known, throwing an important light on the origin and inter-relationship of the Thyrsoporelleæ and the Triploporelleæ. We have also a new genus *Indopolia* which though closely resembling *Neomeris* in certain respects is still distinct in possessing two cortical cells and two sporangia on each primary branch. There is also a new species of *Acicularia*—*A. dyumatsenæ*, with club-shaped spicules about 2½ times as long as thick. The existence of such Acicularieæ with very stout spicules in the upper cretaceous is important in supporting the idea of a possible connection between this genus and *Terquemella*. It is in fact very likely that some of the Terquemelleæ are really primitive ancestors of *Acicularia*. On the whole, it will be seen that the Niniyur fossils add considerably to our knowledge of cretaceous algæ, and will also no doubt be of great value in local stratigraphical correlation. For example, the writer recently noticed algæ similar to those of the Niniyur beds in a series of cherts and quartzites occurring near Vilangudi, about 9 miles to the south of the Niniyur area; and on this and other evidences, he has shown that these Vilangudi cherts and quartzites are the stratigraphical equivalents of some of the Niniyur beds further north and therefore are of the same age, thus leading to the conclusion that the post-senonian transgression of the sea which gave rise to the beds of the Niniyur division must have extended as far south as Vilangudi.

Another series of rocks in the Trichinopoly cretaceous area in which plenty of algæ have also been noticed are the 'coral reef limestones' at the base of the Utatur division. These limestones are of cenomanian age and thus older than the rocks of the Niniyur division which are danian. They occur in detached bands along the western and southern borders of the Utatur division, the most prominent of these being the one seen near the village of Cullygoody, about 9 miles south-east of Utatur. The work of Messrs. C. Prasannakumar and K. Sripada Rao has shown that in all these bands, the limestones reveal the presence of algæ in great abundance and there is no doubt that they have played quite an important part in the building up of these reef limestones.

Fossil algæ have also been discovered in some of the cretaceous limestones near Pondicherry.[4] The exact age of these Pondicherry limestones is uncertain, and all that we are sure of just now is that they come somewhere between the coral reef limestones and the Niniyur beds of the Trichinopoly area, *i.e.*, between the cenomanian and the danian. The Pondicherry algæ are therefore likely to be doubly important, first as providing a possible means of correlating these beds with those of the much better known Trichinopoly area, and secondly, as revealing a new field providing further material for our study of cretaceous algæ.

Another area where notable discoveries of fossil algæ have been recently made by my colleagues Messrs. S. R. Narayana Rao and K. Sripada Rao is near Rajahmundry, in the sedimentary inter-trappean beds of the Deccan trap, which was till recently considered as upper cretaceous in age. A brief account of these algæ has been just published[5,6]; and from this it will be seen that this algal flora is even more recent than that of the danian Niniyur strata and

has a decidedly modern character, as is evident from the occurrence of the living genus *Neomeris*, together with a type of *Acicularia* (with long needle-like calcareous spicules) which has never been noticed in strata older than paleocene. This lends further support to the view recently put forward on other considerations that the Deccan lower inter-trappean beds are at least paleocene in age—a point of great importance in discussing the age of the Deccan trap.[7,8,9] It is also very interesting to notice that side by side with these modern forms, we have in these beds the occurrence of *Holosporella siamensis*[10] a new form founded by Prof. Pia[11] from the Kamawkala limestone (upper triassic) on the Burmo-Siamese frontier. This is a very primitive member of the Dasycladaceæ, and if the upper triassic age of the Kamawkala limestone is certain, its survival into the tertiary as is indicated by its occurrence in the Rajahmundry area is indeed remarkable.

In addition to the above, quite an excellent collection of fossil Charophyta has also been made from these inter-trappean beds by Messrs. K. Sripada Rao and S. R. Narayana Rao. They have studied this material in great detail and have prepared an elaborate paper which will shortly be published as a memoir in the Pal. Indica series of the Geological Survey of India.[12] In this collection they have recognised as many as 13 species of *Chara*, of which 9 are of those already known, and the other 4 appear to be new. The above tabular statement (Table I) prepared by Messrs. K. Sripada Rao and S. R. Narayana Rao shows the stratigraphical distribution of the 9 species of *Chara* already known elsewhere, and now recognised in the Rajahmundry inter-traps.

TABLE I.

| Name of species | Cretaceous | Paleocene | Eocene | Oligocene | Miocene |
|---|---|---|---|---|---|
| *C. wrightii*, Salter .. .. | .. | .. | * | .. | .. |
| *C. helicteres*, Brong. .. .. | .. | * | * | * | * |
| *C. medicaginula*, Brong. .. | .. | .. | * | * | * |
| *C. caelata*, Reid & Groves. .. | .. | .. | * | .. | .. |
| *C. vasiformis* ,, .. | .. | .. | * | * | .. |
| *C. turbinata* ,, .. | .. | .. | * | .. | .. |
| *C. strobilocarpa* ,, .. | .. | .. | * | .. | .. |
| *C. subglobosa*, Groves. .. | .. | .. | .. | * | .. |
| *C. oehlerti*, Dollfus. .. .. | .. | .. | .. | * | .. |

* Indicates that the species is represented.

One striking and important fact which emerges from the above is that all the known species of *Chara* in this collection are exclusively tertiary forms, thus once again indicating at least a lower tertiary age for the inter-trappean beds which contain them.

From the foregoing account, it will be seen that a very rich and varied algal flora has been discovered in the cretaceous and early tertiary beds of South India, the study of which will no doubt lead to conclusions of great interest and importance regarding the origin, evolution, and distribution of cretaceous and early tertiary algæ in general.

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[1] L. R. Rao, *Nature*, 1931, **128**, 255.

[2] — and C. P. Kumar, *Proc. Ind. Acad. Sci.*, 1934, **1**, B 10–18.

[3] — and J. Pia, *Mem. Geo. Sur. Ind. Pal. Ind., N.S.*, 1936, **21**, 1–49.

[4] —, *Proc. Ind. Sci. Con.*, 1932, 380.

[5] J. Pia, S. R. N. Rao and K. S. Rao, *Sitzungsbar Akad. Wiss. Wien.*, 1937, **146**, 227–234.

[6] S. R. N. Rao, K. S. Rao and J. Pia, *Curr. Sci.*, 1938, **6**, 376–377.

[7] B. Sahni, *ibid.*, 1934, **3**, 134–136.

[8] L. R. Rao, S. R. N. Rao and K. S. Rao, *Proc. Ind. Acad. Sci.*, 1936, **3**, 157–164.

[9] L. R. Rao, *ibid.*, 1936, **4**, 208–223.

[10] S. R. N. Rao and K. S. Rao, *Rec. Geo. Sur. Ind.*, 1937, **71**, 397–399.

[11] J. Pia, *ibid.*, 1930, **63**, 177–181.

[12] K. S. Rao and S. R. N. Rao, *Mem. Geo. Sur. Ind. Pal. Ind., N.S.*, 1938, **29** (in press).

# The Fossil Galleries of the Indian Museum.

## History and Recent Improvements.

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### Introduction.

SINCE the publication of the report on "Museums in India", and the recent Museums' Conference held as a result of it, public attention has been focussed on the various aspects of improvements of the museums in this country. It has been recognised that a museum, in addition to its scientific value, should serve an important educative function and therefore it must possess a high popular appeal. A museum should, in fact, be not merely a repository of the nation's art or natural history treasures or its archæological wealth, but it should constitute what has been aptly termed a "University for the masses".

For this purpose it is essential, as was properly emphasised by the Museums' Conference, that museum collections should be divided into reserve study collections, for advanced research, and display collections, for the benefit of the lay public. It is with this object in view that the Fossil Galleries in the Indian Museum, which belong to the Geological Survey of India, are being reorganised and various improvements have recently been effected therein.

### Historical Review.

Before giving an account of the popular improvements recently initiated in the Fossil Galleries of the Indian Museum, a brief review of their origin and growth, which are intimately connected with the origin of the Geological Survey of India, may be of some interest.[1]

Over a century ago (about 1817) the Government of India realised the importance of obtaining coal supplies from India for the steamers navigating the Ganges and other rivers. Later, in 1836, a "Coal Committee" was appointed during the time of Lord Auckland, which continued to function till 1845, when they recommended to the Government of India the formation of a "Geological Survey of the Coal Formations of India". This recommendation was given effect to and in the same year an officer of the Geological Survey of Great Britain was sent as Geological Surveyor to the East India Company. The first official report of the Geological Survey of India was submitted for 1848–49.

Although the Geological Survey of India may be said to have been established in 1845,[2] it had no permanent office till many years later and of course there was no Museum. But certain collections that had been made earlier were deposited at the premises of the Asiatic Society of Bengal in 1835. Previously to this, the Asiatic Society (founded in 1784) had considered (1796) the formation of a Museum. The outcome was that an important collection offered by Dr. Wallich to the Society in 1814 was amalgamated with the 1835 collection, and in 1840 the Government of India appointed a Curator to look after it.

This collection, then, formed the nucleus of the collections that now find a place in the Fossil and Economic Galleries of the Indian Museum. Before, however, these collections were lodged in their present abode, they underwent a number of vicissitudes, having been transferred first from the Asiatic Society's Office to 1, Hastings Street (1856), then from there to the Indian Museum, 27, Chowringhee (1876). A third transfer of part of the collection took place in 1896 to the present Offices of the Geological Survey of India.

During the past ninety years or so the collections in our Fossil Galleries have been supplemented by exchange and presentations from foreign museums, as well as by the specimens collected by the officers of the Geological Survey Department, so that we have now one of the finest collections in the world.

The Fossil Galleries of the Indian Museum are divided into two sections, the Invertebrate Gallery and the Siwalik Gallery, the latter containing mostly Tertiary and Pleistocene vertebrate fossils. The name

[1] A more detailed history of the Geological Survey of India and its Museum is given by Dr. C. S. Fox in *Trans. Min. Geol. Inst.*, 1936, **36**, 13–37.

[2] This date has now been officially accepted.

Siwalik Gallery is perhaps a misnomer, for it contains not only the priceless fossil vertebrates from the Siwalik formation of India, but also many foreign Tertiary species. This has been inevitable on account of the shortage of space. But it is the ultimate aim of the reorganisation scheme now in hand to make the Siwalik Gallery representative of the Siwalik vertebrate fossils only, and to transfer the other fossils to a Foreign Vertebrate Gallery, when more space is available. Likewise the few vertebrates now shown in the Invertebrate Gallery, owing to want of space, will be transferred either to the Siwalik Gallery or to the proposed Foreign Vertebrate Section.

## Recent Improvements.

### *Pictorial Exhibits.*

To the average person the skeletal remains of animals exhibited in the show cases do not convey much. They are to him merely dead bones without any understandable relation to the interesting and often awe-inspiring forms of extinct life that once clothed them. The absence of pictorial restorations was therefore keenly felt. This deficiency has to a certain extent been remedied, for enlarged restorations of some of the more important Indian and foreign fossil genera have been prepared from authoritative works and are now exhibited in the Siwalik Gallery (Fig. 1). On account of their popular appeal these have attracted considerable attention.

Notable among these are the serial wash drawings illustrating various stages in the evolutionary history of the elephant and the horse (Fig. 2, top, right). Such facts that the earliest known elephant, the *Moeritherium*, looked more like a pig than like its modern representative, that extinct forms like *Tetrabelodon* possessed four instead of two tusks, while the African species *Loxodonta africana* possessed four tusks in its upper jaw alone, are better appreciated by drawings than from actual specimens, which are generally imperfectly preserved.

Similarly, pictorial restorations showing that the *Platybelodons* possessed shovel-shaped lower jaws, that *Stegodon ganesha* from the Siwalik formation is one of the giant predecessors of the living Indian elephant, that some of these extinct elephants probably represent successive stages in the evolutionary history of the Proboscideans, better illustrate the family history of the

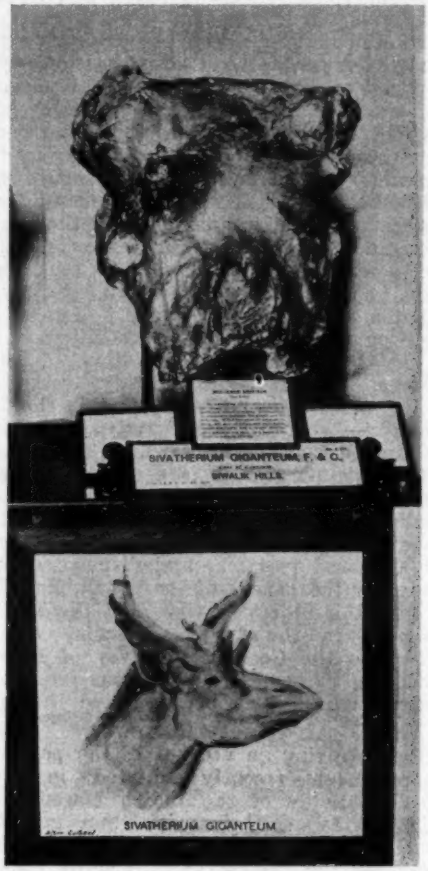



**Fig. 1.** Restoration of interesting extinct Indian fossil species (Giraffidæ) after Colbert.

race than disjointed portions of fossil jaws and bones.

The various genera of the fossil horse of America, *Eohippus* (four-toed horse), *Mesohippus* (three-toed horse), *Merychippus* (three-toed horse with the middle toe stronger than in *Mesohippus*), the Indian three-toed fossil horse, *Hipparion*, and the modern horse, *Equus*, are similarly illustrated.

Other pictorial restorations of the more important and interesting forms are under preparation and will be exhibited in due course.

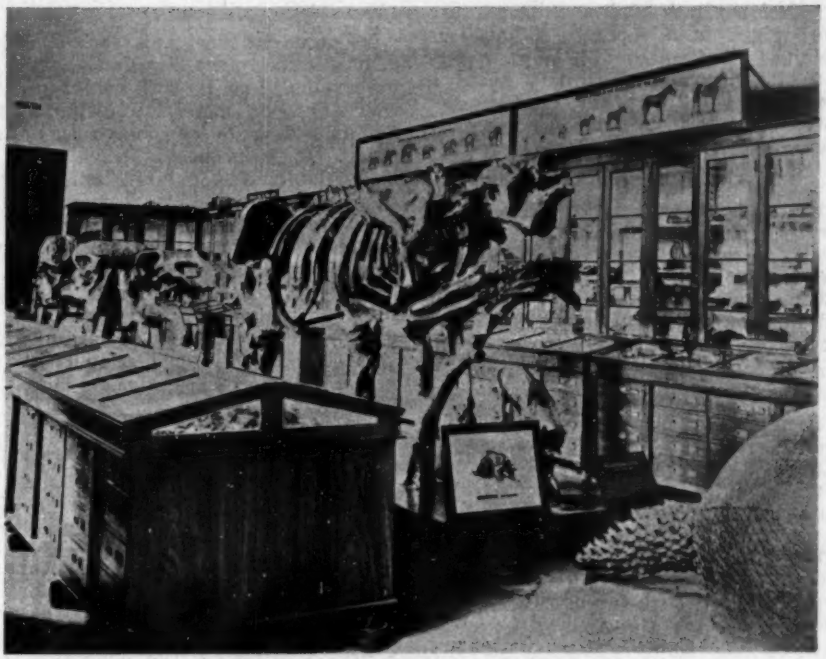


Fig. 2. A general view of the Siwalik Gallery after rearrangement.

## Genealogical Tree of Man and the Apes.

Another exhibit in the Siwalik Gallery which has created general interest is a pictorial chart by the writer in the form of a 'tree' showing the evolution of the human race and of our near relatives, the apes (Fig. 3). An attempt has been made to show at a glance the origin and probable relationship of the various fossil men—*Pithecanthropus erectus* (Java ape man), *Eoanthropus dawsoni* (Piltdown man), *Sinanthropus pekinensis* (Peking man), *Homo heidelbergensis* (Heidelberg man), *Homo neanderthalensis* (Neanderthal man), etc., as well as their relative antiquity, as compared with our own species—*Homo sapiens*. The 'tree' brings out further the relationship not only between the different ape lineages—the Lemurs, the Tarsiers, the New and Old World monkeys and the tail-less or Anthropoid apes, like the Gibbons, Chimpanzees, Gorillas, etc., but also their relationship with modern man and his early progenitors.

Almost the first question that a visitor asks about a fossil exhibit is its age. The

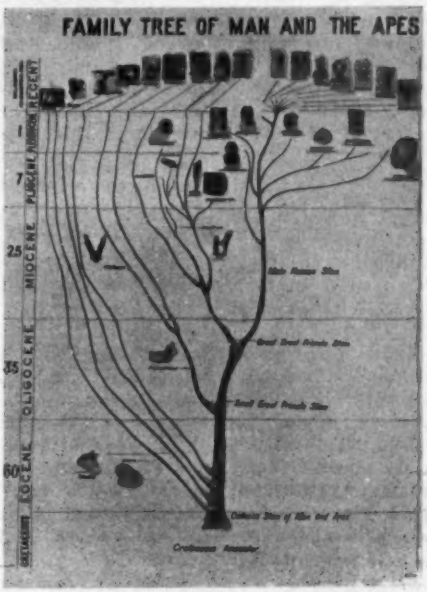



Fig. 3. A recent addition to the Siwalik Gallery.

probable ages of the geological periods in which the fossil men and apes occur, are therefore given in a separate column. It is explained that man, the most highly evolved of the Primates, is only about a million years old, and that his antiquity compared with the 500,000,000 years or more that have elapsed since the dawn of life upon the earth is but a fleeting moment.

### Descriptive Labels in the Indian Languages.

It is obvious that if the exhibits are to be understandable to the lay public they should be explained by descriptive labels in the languages which they read.

In the case of the provincial museums, where the extraneous element in the population is negligible, descriptive accounts in the language of the province and in English would generally be adequate. In the case of a large cosmopolitan city like Calcutta, however, the linguistic problem is naturally an important one. Experience has shown that Hindi, Bengali and Urdu are the three languages which are most useful. Descriptive labels have accordingly been prepared in these languages. In addition to the shorter labels for individual exhibits or fossil groups a generalised account of the exhibits in the Siwalik Gallery, dealing with the evolution, distribution and migration of the Tertiary vertebrates and with the geography of the Siwalik period has also been added. This label gives, in fact, a bird's-eye view of the history of the Siwalik period and of its fauna.

It is refreshing to find groups of semi-literate visitors, endeavouring to decipher the labels in the language which they understand and explaining them to their fellows, whereas formerly most of the fossil exhibits were a puzzle to them. Judging by the spontaneous interest that it has evoked, the introduction of descriptive labels in the Indian languages is perhaps the most important and necessary item of the various improvements effected.

### Guide-Books.

At present there is no satisfactory guide-book for the Fossil Galleries. The existing guide-book of the Indian Museum is far too generalised to be of much use to the average man, for none of the exhibits are adequately explained.

In order to meet this serious deficiency a short guide to the Siwalik Gallery is under preparation but it will deal mostly with the larger or more interesting specimens and is not to be considered as a detailed guide. It is proposed, when more space is available, that exhibits and show cases should undergo further rearrangement, and the preparation of a detailed guide-book at this stage would therefore mean duplication of work. The guide-book now being completed will in due course be translated into the Indian languages, like the other descriptive accounts of the Siwalik exhibits, and will be, it is hoped, of much use to the general public.

### The Invertebrate Gallery.

The exhibits in the Invertebrate Gallery are, for obvious reasons, less spectacular from the point of view of the general public than those in the Siwalik Gallery. Yet much can be done in the way of illustrating progressive stages of evolution in different genera or groups, for which invertebrate species, owing to their prolific occurrence, are most suited. One such series, illustrating the evolution of the Cephalopods has now been exhibited. The *Saligrams* sacred to the Hindus, a specimen of which is exhibited with the evolutionary series, contain specimens of the highly coiled ammonites (Cephalopods) in their cores. They are in fact clay nodules containing an ammonite shell as a nucleus.

Mention need hardly be made of the rearrangement, card-indexing, etc., now in hand, of our fossil collections, to facilitate exchange, presentations and palæontological research.

Finally, it is hoped that when more space is available and financial conditions permit the fine collections of fossils from different regions like Kashmir, Spiti, the Salt Range, South India, etc., will be suitably exhibited in separate sections. This will help to bring out comparisons between the stratigraphy and palæontology of different regions of India, and will constitute a valuable improvement. In respect of wealth of material our Siwalik and Invertebrate Galleries compare very favourably with the greatest museums in the world.

# Khan Bahadur Mian Mohammad Afzal Husain, M.A. (Cantab.), M.Sc., F.N.I.

WE have much pleasure in congratulating Khan Bahadur Mian Mohammad Afzal Husain, Principal, the Punjab Agricultural College, Lyallpur, on his appointment as Vice-Chancellor, the Punjab University.

Khan Bahadur Mian Afzal Husain, who belongs to a well-known family of Batala, Gurdaspur District, Punjab, had a distinguished university career both in the Punjab and at Cambridge. He was the recipient of the Alfred Patiala Research Scholarship of the Punjab University from 1911 to 1913. In the year 1913, he proceeded for higher studies to Cambridge, where he was elected a Foundation Scholar of the Christ's College in 1914 and a Bachelor Scholar in 1916. He won the Frank Smart Prize for Zoology in 1916 and the Charles Darwin Prize for original research work in 1918.

Dr. Afzal Husain.

In 1918, he was selected by the Secretary of State for India for the Indian Agricultural Service and posted as Supernumerary Entomologist at the Imperial Agricultural Research Institute, Pusa. In 1919, he was appointed as the Entomologist to the Government of the Punjab at the Punjab Agricultural College and Research Institute, Lyallpur, which he held with distinction till 1930, except for a short break in 1925, when he officiated as Imperial Entomologist at Pusa. In December 1930, he was placed in charge of the scheme of Locust Research then started by the Imperial Council of Agricultural Research under the designation of Locust Research Entomologist with headquarters at Lyallpur. In April 1933 he reverted to the Punjab Government to take up the duties of the Principal, Punjab Agricultural College, as well as of the Government Entomologist. He is a Fellow of the Punjab University, and has been a member of the Syndicate since 1936.

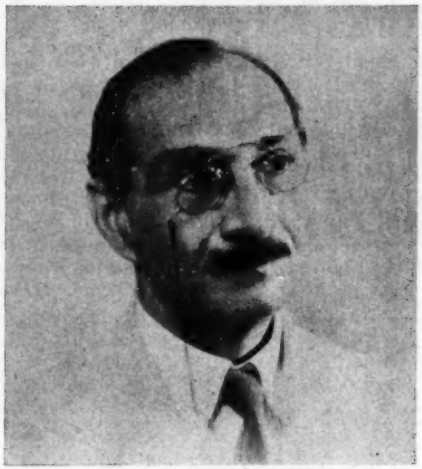
As an Entomologist, he has been responsible for the sustained development of the Entomological Section of the Institute to its present state of high efficiency from the point of view of both economic work and teaching. He is the author of a number of publications relating to various insect pests of the Punjab. He has also published several papers of high scientific value on the bionomics of the Desert Locust, research work on which he has been continuing with the aid of a research grant of the Imperial Council of Agricultural Research, New Delhi, even after relinquishing charge of Locust Research work in 1933.

In his capacity as Principal of an important college and as a Fellow and Member of the Syndicate of the Punjab University, Khan Bahadur Afzal Husain has rendered conspicuous service to the cause of higher education both in the technological and literary fields. He is now summoned to occupy the highest post, which it is in the gift of the University to offer, and it is hoped that the knowledge and experience which have accrued to him will be of inestimable value in directing the destiny of one of the most important educational institutions in India, distinguished alike as an accomplished centre of scientific researches and of formal learning.

We wish Khan Bahadur Afzal Husain every species of success in his exalted sphere of work.

## Mr. D. N. Wadia.

MR. D. N. WADIA, who has just retired after a distinguished service in the Geological Survey of India, proceeds to join his new appointment in Ceylon towards the end of this month. The extensive knowledge and experience of Mr. D. N. Wadia which he has patiently accumulated during his scientific career in India, will be of inestimable value in his exploratory work in Ceylon which presents a virgin field for investigations. The Geology of this southern island must present the most fascinating problems, and we look forward to the report which Mr. Wadia will draw up on the conclusion of his field researches.



Mr. D. N. Wadia.

We wish Mr. Wadia success in his new sphere of activity for which he brings a fresh outlook.

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## Nursing Profession.

AMONG the proposals contained in the Madras Government Communique, recognising this branch of the medical service, suggestion is made that men nurses, as they become available, should be employed in the male wards in the future. As an administrative scheme, this is unimpeachable. But as a service expedient it is undoubtedly a daring experiment. The long and exclusive association of women with this important profession had led grammarians to treat the word "nurse" as a feminine gender. We consider that nursing is part of suckling. The whole problem is essentially biological. Is man physically and emotionally fit for this delicate and fundamentally soft profession? Will he not threaten the patients with dire consequences if they refuse to swallow medicine and nutriment? Does he know how to smile and coax the refractory patients? Can he caress them with becoming feelings of sympathy? We think that man as a nurse must be a new type of *Homo*, who must first learn how to suckle and bring up the new born young babies, before he can be a sweet and smiling angel. If man had the innate gifts surely Scott would not have written his famous apostrophe to woman :

> "O Woman! in our hours of ease,
> Uncertain, coy and hard to please,
> And variable as the shade
> By the light quivering aspen made,
> But when pain and anguish wring the brow,
> A ministering angel thou—"

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# LETTERS TO THE EDITOR.



## Variation in the Composition of the Pigments of Indian Cotton Flowers.

With a view to obtain more of the new compounds Herbacitrin and Gossypin for purposes of further study we had occasion to examine different batches of Herbaceum and Indicum flowers that were obtained during different seasons and from different localities. The composition of the pigments was found to vary from sample to sample. For example, one of the early batches of Herbaceum (Coimbatore, 1933) yielded sufficient amount of Herbacitrin to enable us to study most of its reactions and establish its constitution.[1,2] Subsequent collections did not yield any appreciable amount of this substance. Last summer we obtained a sample from the Bellary District (Hagari A.R.S.) which approximated closely to the earlier Coimbatore sample and it gave us a satisfactory yield of Herbacitrin. The complex glucoside Gossypin was originally isolated from the Indicum flowers collected in Coimbatore in 1933.[3] A large quantity of these flowers from the same place obtained in 1937 gave no Gossypin at all. All the Gossypetin was present in the form of Gossypitrin and further a good amount of Herbacitrin could be isolated. It has been our experience that the Indicum flowers contain no free aglucones whereas the Herbaceum invariably yields free Quercetin. It should however be stated that when expressed in terms of the non-glucosidic bodies the flowers contain the same flavonols in more or less quantities. The variations arise when the glucosides are taken into consideration.

For quick diagnosis of the various fractions of the pigments, colour reactions with alkaline buffer solutions have been very serviceable. Of particular use is the solution with pH 9·8. Herbacitrin and Gossypitrin give emerald green shades after a preliminary yellow whereas Gossypin and Quercimeritrin yield pure yellow which does not change. Gossypetin and Herbacetin give pure blue after preliminary yellow whereas Quercetin produces only yellow which does not change. Quick distinction between the glucosides Herbacitrin and Gossypitrin is rather difficult since they are very similar in properties. However the hydrate of Gossypitrin usually exhibits a marked sintering at about 203° and this gives a reliable indication. Herbacitrin does not show any sintering at this temperature. After hydrolysis the aglucones, Gossypetin and Herbacetin have different melting points though their reactions are very similar.

Here again there may be difficulty in deciding between a pure sample of Herbacetin and an impure one of Gossypetin whose melting point will consequently be lower. We have now discovered one easy distinction between the two flavonols. When a solution of each in absolute alcohol is treated with a small quantity of one per cent. sodium amalgam (Bargellini's reaction),[4] Herbacetin gives a green flocculent precipitate whereas Gossypetin yields a brown one. The production of greenish flocks in this reaction has been taken to be characteristic of flavonols and flavones having three vicinal hydroxyl groups in the benzopyrone nucleus as in Baicalein, Scutallerein[4] and Quercetagetin[5] (positions 5, 6 and 7). Herbacetin which has a different disposition of the hydroxyl groups (5, 7 and 8) should also be considered as giving a positive reaction though the precipitate after it settles down is bluish green. At the beginning it gives the same green precipitate as described for Quercetagetin, Baicalein and Scutallerein. It is, therefore, not safe to consider Bargellini's reaction as a sure indication of the constitution. It however offers a definite and easy means of distinguishing between Gossypetin and Herbacetin.

P. Suryaprakasa Rao.

T. R. Seshadri.

Department of Chemistry,
Andhra University,
Waltair,
*October* 20, 1938.

[1] Neelakantam, Seshadri and Rao, *Proc. Ind. Acad. Sci.*, (A), 1935, **2**, 494.

[2] Neelakantam and Seshadri, *ibid.*, (A), 1937, **5**, 357.

[3] ,, ,, *ibid.*, (A), 1936, **4**, 54.

[4] Bargellini, *Gazetta*, 1919, **49**, ii, 47.

[5] Baker, Nodzu and Robinson, *J.C.S.*, 1929, p. 74.

## Adsorption of Methylene Blue by Active Carbon.

The adsorption of methylene blue by four samples of active charcoal was studied in solutions of varying pH. The results with blood charcoal containing 1·85% ash, may be taken as typical and were as follows:

| Initial pH | Equilibrium pH | Dye adsorbed per gram of charcoal mg. |
|---|---|---|
| 2·26 | 2·10 | 300 |
| 2·39 | 2·46 | 290 |
| 2·94 | 2·06 | 270 |
| 6·15 | 3·75 | 262 |
| 6·80 | 3·97 | 350 |
| 7·32 | 4·10 | 390 |
| 8·66 | 7·02 | 430 |

The increased adsorption beyond the equilibrium pH 3·75 could be accounted for by the enhanced negative charge on the carbon due to greater adsorption of hydroxyl ions from solution, and the opposite effect observed below pH 3·75 was found to be due to adsorption of chlorine ions from the hydrochloric acid which was added to increase the acidity of the solution. The pH region, 3·75 to 3·97, in which a sharp rise in adsorption was observed could be identified with "the isoelectric zone", for it is in this region, probably, that a reversal of the charge on the carbon takes place.

The fall in pH is obviously due to liberation of hydrochloric acid. The rate of fall of pH during the progress of adsorption of methylene blue on blood charcoal was ascertained by successive pH measurements. Assuming that adsorption of each molecule of basic dye causes the liberation of one molecule of acid, a computation was made of the rate of adsorption. The values so calculated were found to lie on a curve which ran closely parallel to the one that was obtained from the results of the experiments. This confirms the view expressed by Bartell and Miller[1] that the liberation of acid or base accompanies adsorption of electrolytes.

The author thanks Dr. K. R. Krishnaswami, D.Sc., F.I.C., for his kind interest and valuable guidance in the investigation.

M. V. C. Sastri.

Department of General Chemistry,
Indian Institute of Science,
Bangalore,
*November* 4, 1938.

[1] *J. Amer. Chem. Soc.*, 1922, **44**, 1866.

## Effect of Treatment on the Hygroscopic Capacity of Soils.

THE fertility of a soil has long been associated with its power to absorb moisture from the air. The hygroscopic coefficient, as a soil characteristic which is connected with other physical properties of the soil, is of great interest in physical studies. The black cotton soils of Bellary are noted for their high powers of absorption. In the following note the effects of alternately heating and wetting the soil and of ignition on the hygroscopic capacity are discussed.

1. *Alternate Heating and Wetting.*—During studies on the hygroscopic capacity of soils it was found that the surface soil usually showed a lower capacity for absorption of water vapour than samples of soil taken from lower layers. An examination of the mechanical composition and other physical properties of the different layers of the profile at Hagari[1] showed that the soil is fairly uniform to a depth of three feet. The observed differences in the hygroscopic capacity of the different layers could not also be explained by the differences in the $SiO_2/R_2O_3$ ratios[2] for the different layers. The decrease in the hygroscopic capacity of the surface soil was naturally thought to be due to the fluctuations in the weather conditions which directly influence the top soil, which is subjected more frequently to alternate heating and wetting than the lower layers. In order to establish this, samples of black cotton soil of Hagari taken from different depths were alternately saturated with water, air dried for two days and dried in a steam oven overnight. This treatment was repeated five times. The hygroscopic capacity at 100, 99 and 75% relative humidities was studied for the treated and untreated samples under the same conditions of temperature. The vacuum desiccator method which was reported to be very satisfactory by other workers,[3] was used. The following results were obtained before and after treatment for the different relative humidities (Table I).

There is a decrease in the hygroscopic capacities at each of the relative humidities at which the experiment was done. The ratio of the hygroscopic absorption at 100% R.H. to that at 75% R.H. remains practically unaltered. The results emphasise the necessity, while dealing with hygroscopic capacities of soils, for defining not only the period of exposure, but the layer from which the soil sample is obtained.

TABLE I.

*Hygroscopic absorption.*

(Period of exposure : 5 days.)

| Depth | R.H. 100% | | R.H. 99% | | R.H. 75% | | Ratio: 100/75% | |
|---|---|---|---|---|---|---|---|---|
| | A | B | A | B | A | B | A | B |
| 0—6″ | 14·78 | 13·39 | 14·07 | 13·70 | 8·52 | 7·89 | 1·74 | 1·69 |
| 6–12″ | 15·73 | 13·90 | 15·27 | 14·11 | 9·29 | 8·28 | 1·69 | 1·68 |
| 12–18″ | 16·03 | 13·85 | 15·33 | 14·17 | 9·38 | 8·23 | 1·75 | 1·68 |

(*A*–before treatment; *B*–after treatment. The figures in this and the next table are the averages of duplicates which agreed among themselves.)

2. *Ignition on Hygroscopic Moisture.*—The effect of igniting the soil in an open flame for 24 hours on the hygroscopic capacity was studied for soils obtained from different places. The ignited and unignited samples of soil were exposed to the same conditions of temperature and humidity for 24 hours. The following table contains the values for the hygroscopic coefficient (100% R.H.) for the ignited and unignited samples.

TABLE II.

| | Soil | Depth | Hygroscopic coefficient | | |
|---|---|---|---|---|---|
| | | | Before ignition | After ignition | Decrease |
| Black Soils | Hagari .. | 0–1′ | 10·47 | 2·49 | 7·98 |
| | Nandyal .. | 0–1′ | 11·85 | 3·84 | 8·01 |
| | Jammalamadugu | 0–1′ | 6·68 | 2·23 | 4·45 |
| | Ambavaram .. | 0–1′ | 6·98 | 2·13 | 4·85 |
| | Koilpatti .. | 0–1′ | 15·50 | 4·03 | 11·47 |
| | Coimbatore .. | 0–6″ | 8·69 | 3·79 | 4·90 |
| Red Soils | Ananthapur .. | 0–4″ | 1·45 | 0·65 | 0·80 |
| | Kadiri .. | 0–5″ | 1·96 | 1·11 | 0·85 |
| | Nandyal .. | 0–1′ | 8·61 | 4·13 | 4·48 |
| | Anakapalli .. | 0–1′ | 4·47 | 2·31 | 2·16 |
| | Koilpatti .. | 0–9″ | 6·58 | 2·40 | 4·18 |

It is clear that after ignition the black soils which are 'heavy' retained from 20 to 45% of the original capacity for absorption while the red soils retained about 35 to 55% of the absorption capacity. On ignition, the hygroscopic coefficient of soils, though greatly reduced, is by no means negligible in relation to the original value. The results are in agreement with those reported by Puri, Keen and Crowther[4] and by Alway[5] for other types of soils.

A. S. Rao.
A. Abdul Samad.

Dry Farming Station,
Bellary,
*September* 27, 1938.

[1] *Report of the Madras Dry Farming Scheme*, Hagari, 1936–37, p. 20, of the *Report of the Soil Physicist, I.C.A.R.*
[2] Report of the Madras Dry Farming Scheme, Hagari, 1935–36, *I.C.A.R.*, p. 34.
[3] Puri, A. N., Crowther, E. W., and Keen, B. A., *Jour. Agri. Sci.*, 1925, **15**, 68.
[4] —, *loc. cit.*
[5] Alway, F. J., *Colloid Symposium*, 1925, III, 241.

## Humic Acid as a Photocatalyst in Photoammonification.

In recent years Gopala Rao and Dhar,[1] Gopala Rao,[2] Gopala Rao and Pandalai,[3] have brought forward evidence to show that nitrification and ammonification in soils are not entirely due to the action of bacteria but can also be brought about at the surface of suitable catalysts under the influence of light. Corbet[4] has confirmed the results of these investigators. Zobell[5] has also shown that nitrification in sea-water cannot be due to bacterial action. By taking some solutions of ammonium salts and exposing them to sunlight with sea-water and magnesium carbonate he found that oxidation of ammonia to nitrite occurs. Fraps and Sterges[6] have, however, expressed some doubt regarding the validity of the photochemical view. Sarkaria and Fazal-Uddin[7] observed that sodium nitrite is oxidized to nitrate in the presence of zinc oxide and sunlight. Dhar and co-workers[8] also noticed oxidation of nitrite in dilute solution when exposed to sunlight in the presence of zinc oxide or ferric oxide. Gopala Rao and Murty[9] have investigated the photodecomposition of nitrate to nitrite; they have found that this occurs as a reversible reaction in sunlight transmitted by glass in the presence of ferric oxide or sterilized red soil. Moreover, they have made the very interesting observation that during the photodissociation of nitrate, any ammonium salt present will undergo simultaneous oxidation to nitrite.

It thus appears that many reactions hitherto ascribed to bacteria in the soil can also be brought about by sunlight with soil as a photocatalyst. In this note we are reporting the results obtained on the photo-ammonification of amino-acids in sunlight in the presence of humic acid. The humic acid employed was extracted from black garden soil with 5 per cent. sodium hydroxide solution and precipitated from the latter by the addition of warm 1 : 1 hydrochloric acid. 250 c.c. of M/20 solution of the appropriate amino-acid was shaken up with 0·25 gm. of humic acid and exposed to sunlight in a pyrex glass flask under strictly aseptic conditions.

The amount of ammonia formed was estimated by the Folin aeration method from time to time.

| Amino acid | Amount of ammoniacal nitrogen formed in mg. per litre | |
|---|---|---|
| | 60 hours | 120 hours |
| Alanine .. .. | 32·42 | 64·21 |
| Aspartic acid .. .. | 21·23 | 42·34 |
| Glutamic acid .. .. | 21·26 | 42·42 |

It is thus evident that humic acid can function as a catalyst in the photo-chemical decomposition of amino-acids in sunlight.

G. Gopala Rao.
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Department of Chemistry,
Andhra University,
Waltair,
*September* 15, 1938.

[1] Gopala Rao, G., and Dhar, N. R., *Soil Science*, 1931, **31**, 379.
[2] Gopala Rao, G., *ibid.*, 1934, **38**, 143; *Jour. Ind. Chem. Society*, 1934, **11**, 617.
[3] Gopala Rao, G., and Pandalai, K. M., *Jour. Ind. Chem. Society*, 1934, **11**, 623.
[4] Corbet, A. S., *Biochem. J.*, 1934, **28**, 1575; *ibid.*, 1935, **29**, 1086.
[5] Zobell, C. E., *Science*, 1933, **77**, 27.
[6] Fraps and Sterges, *Soil Science*, 1935, **39**, 85.
[7] Sarkaria and Fazal-Uddin, *Ind. Jour. Agri. Sci.*, 1933, **3**, 1057.
[8] Dhar, *et al.*, *Nature*, 1934, **10**, 213; *Jour. Ind. Chem. Soc.*, 1936, **13**, 180.
[9] Gopala Rao and Murty, K. S., *Proc. Nat. Inst. Sci.* (India), 1937, **3**, 133.

## Photosensitisation by Stannic Oxide.

PHOTOSENSITISATION by zinc oxide and titanium dioxide has been studied by numerous workers. These oxides absorb in the near ultraviolet and photosensitise various chemical reactions. A. Eibner[1] studied the decolorisation of various dyes in the presence of zinc oxide and light. Winther[2] observed the formation of hydrogen peroxide when water was exposed in a glass vessel in the presence of zinc oxide. E. Baur and co-workers[3] studied the decomposition of aqueous solutions of silver nitrate in sunlight photosensitised by zinc oxide. C. Renz[4] observed that titanium dioxide becomes markedly photosensitive in the presence of certain organic liquids and reducing solutions, particularly glycerol. Gopala Rao[5] studied the photosensitised oxidation of aqueous ammonia in sunlight with titanium dioxide and zinc oxide as photo-sensitisers. He has also observed that the oxidative de-amination of various amino-acids in sunlight is markedly accelerated by these photo-sensitisers. Goodeve and Kitchener[6] studied the photosensitised decolorisation of wool violet by titanium dioxide. Photosensitisation by solids is of great practical and theoretical interest. We have now observed that stannic oxide exhibits marked photosensitive action in the oxidation of aqueous ammonia and the reduction of potassium nitrate, in sunlight. Colloidal hydrous stannic oxide as well as the ignited oxide act as photo-sensitisers, though the latter is somewhat more active. Ammonia is oxidized to nitrate and potassium nitrate is reduced to nitrite.

Some of the results are given below :—

A. 200 c.c. of N/2 solution of ammonia + 0·25 gm. of $SnO_2$ + 50 c.c. water.

B. 200 c.c. of N/2 solution of ammonia + 50 c.c. of 0·5 per cent. $SnO_2$ solution.

| Hours of exposure to sunlight in pyrex-glass flasks | Nitrite nitrogen mg. per litre | |
|---|---|---|
| | A | B |
| 8 | 1·076 | 0·677 |
| 16 | 2·333 | 1·458 |
| 25 | 2·918 | 1·945 |
| 35 | 3·676 | 2·363 |
| 53 | 4·568 | 3·061 |

It is evident from the above table that ammonia in aqueous solution is oxidised to nitrite in the light transmitted by glass. In the absence of stannic oxide or other photo-sensitisers the oxidation occurs only in the extreme ultraviolet.

It is well known from the work of Warburg that potassium nitrite decomposes to nitrite in ultraviolet light of wavelength shorter than 3000 Å. Now we have found that nitrate reduction can occur in light transmitted by glass in the presence of stannic oxide.

A. 200 c.c. of M/10 $KNO_3$ solution + 0·25 gm. of $SnO_2$ + 50 c.c. water.

B. 200 c.c. of M/10 $KNO_3$ solution + 50 c.c. of 0·5 per cent. $SnO_2$ sol.

| Hours of exposure to sunlight | Nitrite nitrogen mg. per litre | |
|---|---|---|
| | A | B |
| 10 | 1·199 | 1·090 |
| 27 | 2·567 | 2·333 |

We have also observed that the decolorisation of various dyes, *e.g.*, methyl violet, methylene blue, brilliant green, is also photosensitised by stannic oxide.

Further work is in progress.

CH. I. VARADANAM.
G. GOPALA RAO.

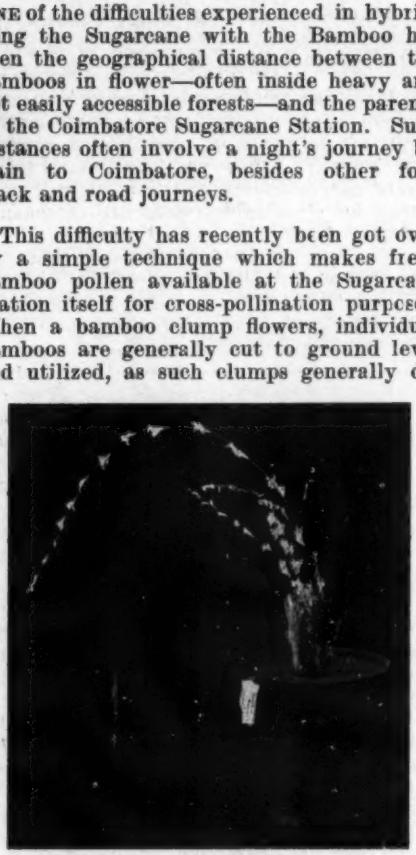
Department of Chemistry,
Andhra University,
Waltair,
*October* 7, 1938.

[1] *Chemiker Zeitung*, 1911, 755, 774, 786.
[2] *Z. Wiss. Phot.*, 1921, **21**, 141, 168, 175.
[3] E. Baur, *Helv. Chim. Acta*, 1918, **1**, 186; E. Baur and C. Neuweiler, *ibid.*, 1927, **10**, 901.
[4] *Ibid.*, 1921, **4**, 961.
[5] *Soil Science*, 1934, **38**, 143; *J. Ind. Chem. Soc.*, 1934, **11**, 617, 623.
[6] *Trans. Farad. Society*, 1938, **34**, 570.

## Technique of Sugarcane × Bamboo Pollination.

ONE of the difficulties experienced in hybridizing the Sugarcane with the Bamboo has been the geographical distance between the bamboos in flower—often inside heavy and not easily accessible forests—and the parents at the Coimbatore Sugarcane Station. Such distances often involve a night's journey by train to Coimbatore, besides other foot track and road journeys.

This difficulty has recently been got over by a simple technique which makes fresh bamboo pollen available at the Sugarcane Station itself for cross-pollination purposes. When a bamboo clump flowers, individual bamboos are generally cut to ground level and utilized, as such clumps generally die



after the flowering. The stumps left in the ground produce, under favourable conditions, a profusion of shoots most of which develop into inflorescence. If such stumps are collected and planted in another place after careful transportation, they put forth inflorescences at the latter place and that too for fairly continuous periods, in some cases as long as three months. The photograph shows one of these flowerings at the Coimbatore Sugarcane Station, after transport from Madras.

Dr. Agnes Arber[1] records this characteristic of the bamboo and considers "that when a bamboo approaches the flowering phase its whole constitution is profoundly modified." The success of the present technique results from such modification.

S. A. HUSSAINY.

Imperial Sugarcane Station,
Coimbatore,
*October* 18, 1938.

[1] Agnes Arber, *The Gramineæ*, 1934, p. 99.

## The Origin and Elimination of the Mass of Opaque Globules Bathing the Internal Organs of Aphids.

THE greater portion of the body cavity of Aphids is occupied by the delicate internal organs, bathed as it were, in a mass of oily-looking opaque globules of a yellow or brown colouration. It appears at first sight that the presence of the globules is due to the action of secretory glands of some kind. Morren[1] (1836) suspected the presence of secretory glands at the base of the cornicles. Buckton[1] (1875) first made attempts to locate such glands and failed. The writer has repeatedly searched for the suspected glands, employing various means but by no means did the search prove fruitful. The hypothesis of secreting glandular structures as the source of the globules is untenable.

Further observations made in this connection lend support to the view that the processes involved in the origin of the globules, are purely metabolic in nature. The metabolic changes occurring in aphids result in two groups of residual end products; one consisting of excess of simple sugars and the other, of certain complex excretory bye-products. Whereas the former leave the digestive tract through the rectum and the anal opening, as the well-known "honey-dew", the latter, exerting great pressure on the walls of the tract, are diffused into the surrounding hæmocele, where they remain in the form of globules in the hæmocelic fluid, which is the so-called blood of aphids, as in all insects, generally. It is these globules that appear to be copious in the internal body spaces, bathing the internal organs.

The reason why these globules of an excretory nature occupy this situation and are not eliminated through the rectum, has

not been hitherto explained. The reason is to be found in the fact that the malpighian tubules which extract harmful residual products of digestion in solution in the blood, in insects, are entirely absent in aphids. The elimination of the globules from the body, however, is carried out in a simple manner by the tubular cornicles opening into the hæmocele of Aphids in the abdominal region where the globules abound. It is a matter of common observation, that, periodically, as the density increases, tiny masses of viscous matter appear at the open tips of the cornicles and are then forced out. Mechanically, too, very small quantities of the globules can be obtained by the application of slight lateral pressure on the abdominal wall. The injurious nature of the globules can be simply demonstrated by blocking the mouths of the cornicles with glue, when, gradually, the insects become sluggish, swell up and die away, turning semicrystalline. The cornicles which are peculiar only to the group Aphidæ in the insect world, are to be regarded as the only outward passages for a periodical elimination of harmful excretory products of metabolism, in the absence of malphighian tubules.

At least one of the constituents of the opaque globules was first made out by Muller as Salicin. The writer has, in several cases, confirmed this by digesting various species of aphids in chloroform and benzene, when the globules, forced out of the cornicles, left on the watch glass, after the evaporation of the liquid, numerous radiating silky needle-like crystals which turned vivid red on being touched with a drop of concentrated $H_2SO_4$. Doubtless, other constituents may also be isolated by suitable means. Salicin has been a recognised product of plant metabolic activity and is usually isolated, as harmful, from the vital processes.

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*November* 4, 1938.

[1] *A Monograph of British Aphids*, 1875.

## Ovulation in Fish.

### (Effect of Administration of Extract of Anterior Lobe of Pituitary Gland.)

THE sex stimulating harmone of the anterior lobe of the pituitary gland has been the subject of considerable research in connection with the Mammalia, Reptilia and Amphibia, but so far very little work has been done on the Pisces. Cardoso (1934 *b*) studied the relationship of hypophysis and sexual glands in the young and immature *Pimelodus clarias* in S. Francisco River (Brazil) and the results showed that the development of the sexual glands is controlled by the pituitary. Injections of fresh extracts of hypophysis produced a big increase of the sexual organs, and in mature *Pimelodus* sp., it was possible to induce ovulation by daily injections of pituitary extract. Ihering (1935) obtained ovulation with injection of pituitary extract on *Astynax*. Young and Bellerby (1935) studied the effect of the administration of the preparation of the anterior lobe of pituitary on metamorphosis of Lamprey, but were not able to induce it by injection of anterior lobe extract.

So far as can be ascertained no investigation on the effect of the administration of the anterior lobe of the pituitary gland has been carried out on fishes in India. The Indian Carp (*Cyprinidæ*), the most important of the fresh-water fishes, breed in nature in June and July when the streams are flooded by the monsoon rains. If the floods are not in time or are insufficient, the fish refuse to spawn and become egg bound (Hamid Khan, 1924). So far all attempts to make the fish, such as *Rohu* (*Labeo rohita*), *Morakha* (*Cirrhina mrigala*) and *Theila* (*Catla catla*), breed in tanks and ponds, which are not subject to floods, have not succeeded. With a view to elucidate the factors which stimulate the Indian Carp to spawn, investigations on the effect of the extract of the anterior lobe of the pituitary gland were undertaken in 1937 and 1938 and the results so far achieved, are embodied in the present paper.

I am indebted to Professor J. Gray and Dr. G. S. Carter of the University of Cambridge for suggesting the lines of research to be followed in this connection.

*Cirrhina mrigala* H.B., a common carp in the Punjab, attaining three feet in length

and fifteen to twenty lbs. in weight, was selected for experiment. The fish were in their third year and quite mature, but on account of their stunted growth in captivity, their size varied from 8 inches to 10 inches. The experiments were started in June in 1937 and in July in 1938. The preparations used were: Anterior Lobe Pituitary Gland (Tablets P. and D.), Antiturin S. (P. & D.) and Prolan (Bayer). The first preparation was administered in Ringer's solution (Bayliss, 1931) and the other two, in sterilized distilled water. Each tablet of Anterior Lobe Pituitary Gland contains 2½ gr. (0·16 gm.) desiccated Anterior Lobe, equivalent to 12½ gr. (0·8 gm.) of the fresh substance. It was administered in the strength of 3·2 mg. to 6·4 mg. per injection once a week. Of the other two preparations 1 c.c. contains 100 rat-units (R.U.). Various strengths were obtained by dilution with sterilized distil'ed water and were administered in the strength of 5 to 10 R.U.

5 R.U. injection was given to three lots of fish. The first lot received one injection, the second two, and the third three injections per day. 10 R.U. was given to two lots: one lot receiving one injection daily and the other, one injection on alternate days. The injections were given by means of a hypodermic syringe in the dorsal muscles of the fish, and 3% salt bath was given to the fish daily to prevent growth of fungus. The fish kept as control were injected with sterilized distilled water.

The fish under investigations were kept in glass aquaria. Aeration was maintained either by Semper's Aerating apparatus working with water tap or by electric chemical pump. The oxygen and carbon dioxide of the water were daily tested. The dissolved oxygen (Wrinkler) ranged from 1·068 to 4·806 c.c. per lit., and free carbon dioxide from 0·632 to 3·439 c.c. per lit. The pH ranged from 7·5 to 8·5. The fish during their captivity were fed on Hydrilla planted in the aquaria and on Crustacea such as *Moina* and Cyclops.

The injected fish were examined from time to time to see their condition. It was observed that in the case of Anterior Lobe of Pituitary Gland, 16 mgm. and in the case of the other two preparations 40 R.U. were sufficient to induce ovulation. With the last two preparations it was after 96 hours, when the fish had received 40 R.U., that the fish yielded eggs on stripping. The amount of harmone greater than 40 units in no way hastened the process of ovulation, while a lesser amount retarded it. The males yielded milt readily even without injections.

Artificial fertilization of eggs, obtained by stripping, by mixing them with milt from the male was, however, not successful. Further investigations in this direction are needed. The control females injected with sterilized distilled water were tested at the same time but they did not yield any eggs.

The behaviour of the Indian Carp under investigation seems to indicate that it is the pituitary sex harmone which is directly responsible for ovulation. The discharge of such harmone into the blood may be a consequence of some meteorological phenomenon such as rain, and flood, or some chemical or physical evnironmental factor such as pH, oxygen, carbon dioxide turbidity and density of water, temperature or some chemical salts in the water. These external factors still remain to be investigated.

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Lyallpur,
Punjab,
*October* 18, 1938.

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Hamid Khan, *Journ. Bomb. Nat. Hist. Soc.*, 1934, **29**, 958.

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## Evolution of the Vegetative Form in the Gesneriaceæ.

THE present note has been inspired by a recent paper of Sir Arthur W. Hill[1] on "The monocotyledonous seedlings of certain dicotyledons, with special reference to the Gesneriaceæ". This paper opens with a discussion of certain dicotyledonous genera whose seedlings normally possess only a single cotyledon instead of the normal pair. The author shows that in every one of these

cases there is no evidence in favour of Sargant's theory that the single cotyledon represents two fused cotyledons. He believes that in every case the single cotyledon has resulted by the suppression of the second. This conclusion in the light of our present knowledge seems to be well-founded. The greater part of Hill's paper, however, is devoted to a consideration of the seedlings and vegetative form of certain plants of the Gesneriaceæ, belonging to the tribe Cyrtandroidæ—*Streptocarpus*, *Boea*, *Didymocarpus*, *Chirita*, *Klugia*, *Saintpaulia*, *Haberlea*, *Moultonia*, *Monophyllæa*, *Didissandra* and a few more—, in which one of the two cotyledons exhibits continued growth by means of a basal meristem, while the other generally aborts at an early stage of development. Here the author draws certain important conclusions about the evolution of these plants, but these are based on very slender evidence. They depart fundamentally from our conception of evolution in the angiosperms in that those forms which differ most from normal dicotyledons are regarded to be the most primitive. If they are not refuted, there is danger that they may be adopted by some taxonomists in the preparation of a phylogenetic classification of the family. The following remarks are, therefore, made with a view to present the evidence against these conclusions.

The author distinguishes three types in the material studied by him. The first includes the unifoliate forms like many species of *Streptocarpus* (*Dunnii*, *Wendlandi*, *polyanthus*, etc.), a few species of *Chirita*, *Didissandra sesquifolia*, *Didymocarpus pygmæa*, and the genera *Platystemma*, *Moultonia*, *Monophyllæa*, *Trachystigma* and *Acanthonema*. These possess only one leaf throughout their life, which is the persistent cotyledon greatly enlarged by basal intercalary growth. There is no trace of a plumule in the seedlings of such plants, and the flowers often arise from the leaf midrib.

The second group, Rosulatæ, is characterised by the plants developing a rosette of a few leaves. It includes other species of *Streptocarpus* (*Rexii* and *parviflorus*), *Chirita Trailliana*, and the genera *Saintpaulia*, *Ramondia*, *Haberlea*, etc. In these one cotyledon is retained, as in the unifoliate series, and is usually the largest leaf of the rosette. No plumular axis is developed in this group also.

The third group, Caulescentes, includes several species of *Streptocarpus*, most Chiritas *Briggsia*, *Klugia* and some other genera, consisting of herbaceous plants with well-developed leafy shoots. These differ from normal herbaceous dicotyledons only in the seedling structure, which is quite similar to that of unifoliate forms, and the development of a functional bud in the axil of the persistent cotyledon which often grows as vigorously as the main axis and makes the plant markedly one-sided.

The distinction between the three groups, however, is not absolute. Some species of *Chirita* (*bifolia*, *monophylla*, etc.), which are normally unifoliate, develop under certain conditions a second small leaf. Some others like *C. capitis* and *C. hamosa* are unifoliate when growing on rocks or under other unfavourable conditions and caulescent when growing in more favourable habitats.

From a comparison of these types the author concludes that the unifoliate genera and species represent the primitive conditions and the caulescent forms are derivates from ancestors which had assumed the unifoliate habit. This conclusion is based chiefly on three arguments. (i) In *Chirita lavandulacea* the large cotyledon and the lower foliage leaves have fairly long petioles, and the lower flowers are truly axillary. The upper floriferous leaves are almost or completely sessile and produce flowers from their midribs, exactly as the flowers are borne along the cotyledonary midrib in monophyllous species of *Streptocarpus*. For this reason one of these flower-bearing leaves of *Chirita* is regarded by the author as equivalent to that of a unifoliate *Streptocarpus* and it is suggested, when a herbaceous *Chirita* reaches the flowering stage, it exhibits a reversion to the ancestral condition. (ii) it explains the anisophylly of the cotyledons even in the caulescent forms. (iii) The appearance of monophylly in dimorphic species of *Chirita* when grown under unfavourable conditions is a reversion to the ancestral state.

A careful consideration of these arguments shows that there is not much force either in the first or the third, and the second by itself cannot have much value. That floriferous shoots in their form show reversion to the ancestral condition is a quite unproved assumption. Jeffrey,[2] who did much to clearly formulate the principles of

comparative morphology, has clearly warned about the application of the doctrine of conservative parts to the reproductive shoots of the angiosperms. Similarly, in the dimorphic species of *Chirita*, the caulescent form can as well be regarded as a reversion as the unifoliate form.

The greatest objection to Hill's conclusions, however, is that these are not based on a broad foundation of comparative morphology, nor is evidence presented from any other source to support them. In considering the evolution of these atypical plants of the Gesneriaceæ, he has paid no attention at all to the structure of the related forms. His conclusions might have been correct, if the Gesneriaceæ had been the only family of flowering plants on this earth. It is, however, only one of many. It is further closely related to the families Scrophulariaceæ, Orobanchaceæ and Bignoniaceæ; and the order Personales in which these families are placed is believed to have been derived from the orders Boraginales and Solanales. Such specialised unifoliate forms as are found in the Gesneriaceæ are absent in these orders and families. To regard them primitive for the Gesneriaceæ, therefore, is quite unsound.

From a comparison with the related families, the course of evolution in these atypical Gesneriaceæ appears to be as follows. The first change from normal forms appears to have been the development of the anisophylly of the cotyledons. At first the two cotyledons might have been merely unequal in size. Later the larger one of them became more specialized. It developed an intercalary meristem at its base and a functional bud in its axil. In this manner, the above-described caulescent forms came into existence. Further reduction and specialization of these, perhaps under the influence of unfavourable habitats, may be supposed to have led to the origin of the rosette and finally the extraordinary unifoliate types.

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*September* 9, 1938.

[1] *Ann. Bot., New Series*, 1938, **2**, No. 5.

[2] *The Anatomy of Woody Plants*, Chicago, 1917.

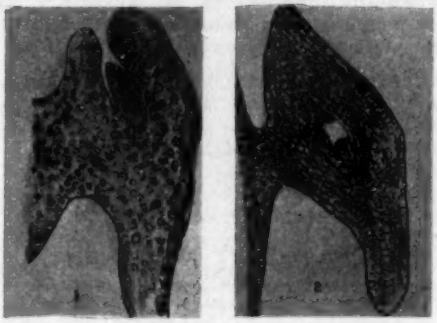
## A Note on the Morphology of the Ovule of Rubiaceæ with Special Reference to Cinchona and Coffee.

In a recent paper on "Endosperm and Perisperm of Coffee with notes on the Morphology of the Ovule and Seed Development", Houk (1938) has revived a view about the structure of the Rubiaceous ovule that had been long given up. As coffee seed is a product of great economic value and a correct knowledge of its structure is very important for genetical studies, it is desirable to review his work.

The mature ovule in the family Rubiaceæ generally consists of many layers of uniform parenchymatous tissue surrounding the embryo-sac. It is not possible to make out a nucellus distinct from the integument. The micropyle is very slender and somewhat indistinct. It can be made out only in perfectly median longitudinal sections and with the help of high magnifications. It is no wonder, therefore, that the morphology of the ovule of Rubiaceæ became a subject for discussion in the last century and Schleiden (1837) stated that it consists of nucellus without integument, while of 1902 Llyod introduced the concept in 'integument-nucellus'. The correct position, however, has been indicated by Schnarf (1931) in his recent review of the embryology of the angiosperms. It is that the ovule of the Rubiaceæ consists of a poorly developed nucellus and a single integument. This view is based on the development of the ovule. It is seen that in the early stages the nucellus and the integument are quite distinct from each other. The micropyle also is quite prominent, but the amount of nucellus, as in the Gamopetalæ in general, is very small. It consists only of a single layer surrounding the megaspore-mother cell. As the embryo-sac develops, this layer of nucellar cells is crushed; and the embryo-sac comes to be situated directly to the inside of the integument. In the meanwhile by the growth of the integument the micropyle becomes nearly obliterated. This ovule thus begins to give the deceptive appearance described above.

This point is well illustrated by the accompanying figures from *Cinchona succirubra*. Fig. 1 represents a longitudinal

section of an ovule at the megaspore-mother cell stage. The single integument, a distinct though poorly developed nucellus and the micropyle are clearly seen. Fig. 2



*Cinchona succirubra.*

Longitudinal sections of ovules.

FIG. 1, at the megaspore-mother cell stage; FIG. 2, at the mature embryo-sac stage. Fig. 1 is more highly magnified than Fig. 2. The microphotographs have been slightly touched to make the boundary of the ovules more distinct.

shows a similar section of an ovule containing a mature embryo-sac. The integument now has completely surrounded the nucellus. The latter has completely disappeared and the micropyle has been nearly obliterated. It could be made out in this section by using a higher magnification.

The ovule of coffee passes through the same stages of development as that of *Cinchona* and should be interpreted in the same way. Faber (1912) who studied the morphology of the coffee flowers more than twenty years ago, has very clearly sketched these changes and correctly described the ovule to possess a weakly developed nucellus and a massive integument. Houk (1938), however, rejects this generally accepted view about the morphology of the Rubiaceous ovule for coffee. He asserts that Faber's interpretation is untenable and supports the older Llyod's 'integument-nucellus' concept but gives no reasons for any of these conclusions. In a paper dealing with the morphology of the ovule, which he takes to be different from that of other flowering plants, he makes no reference to the early stages of ovule development. His views are thus not based on any strong evidence and should be rejected. If he had just studied the development of the ovule, he would have undoubtedly found the stages in its development described by Faber and agreed with his findings.

Another point discussed by Houk is the nature of the nutrient tissue surrounding the embryo. He shows that the endosperm formed is very small in amount and evanescent, and therefore regards the nutrient tissue as perisperm. In the light of what has been said above about the morphology of the ovule, this is only a part of the integument of the ovule and is thus a part of the testa. The small nucellus which is present in the young ovules is crushed early by the growing embryo-sac and does not persist in the seed. The general statement, "Embryo small, in rich endosperm" (Willis, 1931), found in books on systematic botany about the structure of the Rubiaceous seed appears to require modification. It is very likely that what has been regarded as endosperm in many cases is only a part of the testa.

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*November* 8, 1938.

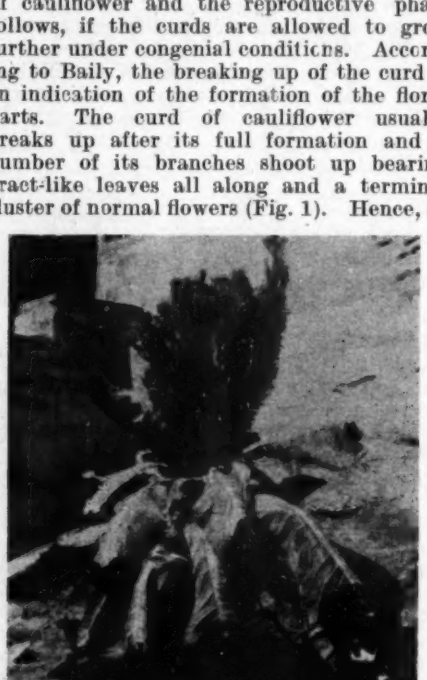
[1] Faber F. C. von, *Ann. Jard. Bot. Buitenzorg*, 1912, **25**, 59–160.
[2] Houk, W. G., *Amer. Journ. Bot.*, 1938, **25**, 56–61.
[3] Llyod, F. E., *Mem. Torr. Bot. Club*, 1902, **8**, 1–112.
[4] Schleiden, M. J., *Arch. Naturgesch.*, 1837, **Abt. A3**, 289–414.
[5] Schnarf, K., *Vergleichende Embryologie der Angiospermen*, Berlin, 1931.
[6] Willis, J. C., *A Dictionary of the Flowering Plants and Ferns*, Cambridge, 1931.

## Flowering Branches from the Curd of *Brassica oleraceae* Linn. var. *botrytis* D.C.

A RECENT article on the development of the flowers from the curd of Broccoli by S. O. S. Dark (1938) prompted the writer to report a similar phenomenon in the cauliflower, photographed in 1934 and subsequently noticed in several localities. The structure of the curd of cauliflower does not appear to have been properly understood. According to Masters (1849) and Worsdell (1915) the flower stalks in the curd of Broccoli and cauliflower are hypertrophied and the flowers are either defective in development or they are not developed or only with a vestigial calyx. Goebel (1900) while

considering the relationships between the flowers or the organs of reproduction in general and the vegetative parts, mentions that in the inflorescence of the cauliflower the flower stalks are abnormally thickened and fleshy; and correlates this feature with the abortion of the whole flower as evidenced by *Celosia cristata*, *Muscari comosum* and Cauliflower. In the opinion of Baily (1919) *Brassica oleraceæ botrytis* is a form of common cabbage species producing an edible head of malformed and condensed flowers and flower stalks.

The formation of the curd is generally the termination of only the vegetative phase of cauliflower and the reproductive phase follows, if the curds are allowed to grow further under congenial conditions. According to Baily, the breaking up of the curd is an indication of the formation of the floral parts. The curd of cauliflower usually breaks up after its full formation and a number of its branches shoot up bearing bract-like leaves all along and a terminal cluster of normal flowers (Fig. 1). Hence, as



An entire plant of Cauliflower (*Brassica oleraceæ* Linn. var. *botrytis* D.C.). The breaking up of the curd and the development of number of branches bearing flowers can be seen.

stated by Dark, the curd is evidently an intermediate stage between the vegetative and the reproductive phases in the life-history of the cauliflower and Broccoli. "The curd developing phase" of cauliflower can thus be compared with the condition specially evident among the cereals, *viz.*, "the formation of tillering node". When the inflorescence of cauliflower has completed its embryonic development, then the meristematic growth commences and a rapid elongation of the parts sets in.

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Central College,
Bangalore,
*October* 30, 1938.

[1] Baily, L. H., *The Standrad Encyclopedia of Horticulture*, 1919, 2.
[2] Dark, S. O. S., *Ann. Bot., N.S.*, 1938, 2, 7.
[3] Goebel, K., *Organography of Plants*, 1900, vol. 1.
[4] Masters, M. T., *Vegetable Teratology*, 1849.
[5] Worsdell, W. C., *Principles of Plant Teratology*, 1915.

## An Important Genetic Constant.

CH. NEK ALAM in a very interesting paper appearing in *Current Science*[1] has stated that the segregation constant of quantitative characters is approximately 3. Appreciating his statement I shall point out that his constant might be applicable in the cases when all gametes formed by $F_1$ hybrids are viable and when no competitive pollen-tube growth takes place. Self-incompatible plants (rye, sugar, beet, etc.,) in which competitive pollen-tube growths occur (often termed as selective fertilization, as for example, in certain strains of maize) the segregation constant might not be 3 or about that, since certain types of gametes are eliminated. (Some quantitative characters can be linked with those regulating pollen-tube growth.) Structural hybridity is also a factor that would condition considerable deviations from the Nek Alam's segregation constant, since they form usually a variable percentage of non-viable pollen (also gametes) and their viable pollen grains have often differential pollen-tube growth. Structural hybrids also produce certain types of non-viable zygotes, which also can condition a deviation from the normal constant.

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*October* 1, 1938.

[1] *Curr. Sci.*, 1938, 7, 2.

# REVIEWS.

**Van Nostrand's Scientific Encyclopædia.** (Chapman & Hall, Ltd., London), 1938. Pp. 1233. Price 50*s.* net.

We have had extensive opportunities of using this work and feel convinced that besides scientists, the intelligent public also will find it indispensable. To have brought within the compass of a single volume such a vast amount of knowledge covering all the modern developments of basic sciences and their applied branches, is an impressive achievement on which the authors and publishers deserve warm and unstinted congratulations. The responsibility of dealing with each of these principal fields of knowledge has been entrusted to a single author who, however, had the benefit of consulting a number of experts, and the work as a whole, while possessing all the advantages of a unitary treatment, gains immensely from the authoritative collaboration. The results of such co-operation are reflected in the progressive development of the discussion of topics, each, commencing with a simple definition stated in easy terms, receives a full treatment of all the principal aspects necessary for a complete comprehension of the subject. Where, however, the nature of the subject demands a fuller treatment, the authors have given the information in fairly long articles, the technical features being fully illustrated.

We recognise that there must be limits in the compilation of a one-volume book, especially regarding the length of articles and the number of illustrations. We claim to have consulted the book practically in all branches of knowledge with which it treats, and we have in every case found that the explanations given are adequate, lucid and up-to-date. We are greatly impressed by the comprehensiveness of the scope and the treatment of the topics of the book, rendered possible by the system of cross-indexing. By this system the user of the book is enabled to obtain a comprehensive treatment of each term by consulting the references under several heads, such terms being printed in bold face type. A book of reference of the type under review is a work of supreme necessity, as most of the transactions in every field of civilised communities have a wide bearing on the applications of scientific method, and a knowledge of the general facts and principles of the basic sciences being indispensable to people in technical and general service. In fact an intelligent understanding of the progress of events in the world implies a fairly wide acquaintance with scientific terminologies, and we know of no work of reference which helps the general reader of daily news and popular scientific journals to acquire a more competent knowledge of such terms than Van Nostrand's *Encyclopædia*. We have found that in certain fields of study, the book presents information in a readily assimilable form, for which, in its absence, one would perhaps have to digest large and special treatises for obtaining the same amount of mental nutrition. The worth of the book lies in the strong appeal it has for the general cultured public and for those engaged in scientific and technical pursuits.

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**Social Psychology.** By Daniel Katz and Richard L. Schank. (John Wiley & Sons, New York; Chapman & Hall, Ltd., London), 1938. Pp. xiv + 700. Price 18*s.* 6*d.* net.

This book will be a welcome addition to the growing volume of literature on the subject of social psychology whose importance in its relations to human problems is widely recognised. It is a successful attempt for assimilating the large body of facts and concepts in the field of social science into a systematic framework. The chief value of the book lies in the fact that it gives a fairly comprehensive treatment of the experimentally derived knowledge, and in the unity in the plan of approach of the materials and problems from the view-points of different authors who have investigated them. In the first part the reader finds a full and competent description of the social world of every-day experience, "the actions and ideas of people in terms of conformity and non-conformity, taboos and mores, crimes and customs, co-operation and competition". These social events follow a natural psychological order and each is described adequately. In the second

part, a detailed analysis is given of the mechanisms of these social events, the motives and processes underlying them, based on experimental data. Part three is devoted to the exposition of human personality, the socialization of the individual, the internationalization of cultural values, prohibitions and social conflicts. This section is a revelation of the social world as seen through the eyes of the clinician or psychiatrist. The social drama as it appears to the social engineer or planner forms the subject-matter of Part Four of the book. This section forms really what is known as collective psychology whose problems are the complicated interrelationships of human beings in their individual capacities and of the society as a whole. The four sections constitute a perfectly natural and logical development of the whole theme, and the readers will be delighted to follow the descriptive account leading to an incisive analysis of the experimental findings and then introduced to the genetic account of the social phenomena, finishing up with a historical and dialectical treatment of the whole subject-matter of multi-individual behaviour.

Human sciences like social psychology which have profoundly affected the contemporary philosophic thought, are likely to assume the responsibilities of authoritative leadership of public affairs, and the results obtained from their investigations, which ultimately underlie the acts and policies of statesmen, ought to form an indispensable part of their mental equipment. Social psychology forms the foundation of political science and economics and gives a new orientation to the general line in the field of administration. The scientific objectivity and discipline which are emphasised in the treatment of the perceptual data underlying social psychology, invest the book with the rigorous precision of exact sciences.

We have nothing but praise for the authors who have written the book in an easy and lucid style. The facts are presented in their natural order of psychological sequence. Every chapter is stimulating. The whole book is thoroughly enjoyable. It is one of the few works on social psychology which an elementary student, a scholar and a statesman can read with pleasure and profit.

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**Solid Mensuration with Proofs.** By W. F. Kern and J. R. Bland. (Chapman & Hall, Ltd., London), 1938. Second Edition. Pp. vii + 172. Price 10*s*.

This is a comprehensive book on the mensuration of solids, and is written so that even a beginner can use it profitably to solve practical problems. The first chapter contains a resumé of the formulæ for plane figures, including Simpson's rule for the approximate evaluation of an area. The second chapter gives the preliminary notions and theorems on lines, planes and angles in space. The next three chapters contain a discussion of the volume and surface of (*a*) cube, prism and cylinder, (*b*) pyramid and cone, (*c*) frustum of prism, cylinder, pyramid and cone. The sphere, with its zones, segments and sectors, comes up next for treatment. The seventh chapter is devoted to the solids of revolution, and the eighth to the general prismatoid. The last chapter gives the summary of all the formulæ employed, and also a collection of reference theorems from plane geometry.

In the Appendix the authors try to prove the theorem on limit that "if two variables are always equal and each approaches a limit, the limits are equal". For those students who are familiar with the notion of limit, this theorem would be quite obvious without any proof, but for those unacquainted with the idea of limit, the whole proof seems to beg the question. That is the case also with the proof of Cavalieri's theorem and of the formula for the surface and the volume of a sphere. The authors claim "the most distinctive feature" of their book to be the inclusion of "simple proofs of the volume and surface formulas". All these proofs (apart from those for the sphere) are based on Cavalieri's theorem, but the proof of this theorem itself as given in the book, is vague and intuitive, and cannot be called either simple or rigorous. It is incomprehensible why the authors ban the use of elementary calculus. Surely a student who has reached a stage where he can employ the complicated formulæ for the frustum of a solid or the general prismatoid, would have already grasped the elements of the differential and integral calculus. The calculus would enable the authors to include proofs of the theorems of Pappus also. According to the plan of their work, they should not

have employed these theorems without proving them first. After all that has been written on the foundations of mathematics, it is astonishing to find the authors trying to define familiar things like plane, etc. "A plane is a surface such that...." Do they really think that the notion of a surface is simpler than that of a plane? To prove the volume theorem on p. 27, it is required to construct a rectangular parallelepiped with a base and altitude respectively equal to the base and altitude of the given solid. Isn't this tantamount to the quadrature of the circle?

Apart from these defects, the book should prove valuable to the student of the subject. Photographic arrangement throughout the book helps a great deal in visualising solid figures. Many illustrative examples have been thoroughly worked out. A large number of problems bearing on practical affairs is given at the end of each chapter. Logarithmic and trigonometric tables at the end of the book should prove quite useful in solving problems.

The book has been vary well printed, but the price appears to be inordinately high.

M. R. S.

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**Physik** fur Studierende an Technischen Hochschulen und Universität. By Ingenieur Dr. Paul Wessel, edited by Dr. V. Riederer von Paar. (Verlogvon Ernst Reinhardt, München), 1938. Pp. 54. Price R.M. 4·90.

This book is designed to suit the requirements of undergraduate students of Physics inasmuch as it deals with almost all the useful branches of the subject in fairly easy style and covers even the most modern achievements of science. Numerous applications from allied sciences are given and that obviously increases the utility of the book.

The work is divided into sections, outlines of Physics, short revision and collection of formulæ, examples and answers and tables and numerical data.

The author has in this manner succeeded in making the book useful to the interested reader, even beyond his immediate need, *viz.*, the passing of a certain examination. A technician, a chemist, a medical man, in fact anyone who is required to use the results of physics, will readily find the necessary result in this compact volume.

The diagrams in the text are simple, some of them are modern and very attractive; *e.g.*, the diagram on p. 185 illustrates the behaviour of paramagnetic and diamagnetic bodies in a magnetic field; the periodic system chart on p. 327 is certainly ingeneous.

Modern topics like the atomic structure, nuclear physics, sound films, television, principle of uncertainity and many others are all included in the volume.

The amount of matter that finds itself compressed into this single volume is large, consequently the statements are very brief and pointed; lengthy descriptive explanations are carefully avoided. It is in this respect that the beginner would naturally find considerable difficulty. He would not be able to use the book for learning Physics, but as a book of reference the compilation is unique and should prove valuable.

G. R. P.

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**Statistical Tables for Biological, Agricultural and Medical Research.** By R. A. Fisher and F. Yates. (Oliver and Boyd, London), 1938. Pp. viii + 90. Price 12*s.* 6*d.*

Coming, as it does, after a period of rapid development in Applied Statistics to which Professor Fisher himself has contributed a large share, this book of tables is a valuable supplement to his *Statistical Methods for Research Workers*. The "Statistical Tables" will be a very useful aid to computation and interpretation of data for a research worker using modern statistical methods. In preparing the tables, the authors have paid particular attention to the needs of the practical worker. For instance, Table X will facilitate the ready use of data given in proper fractions for finding the corresponding normal deviates although the same values can be determined from Table IX by converting the fractions to percentages.

Tables I–VII cover the same ground as the tables published in the *Statistical Methods for Research Workers*; but there are many noteworthy improvements. The addition of the values for P = ·001 in tables for $t$, $x^2$, and $r$ increases the usefulness of the tables and the distribution of $z$ has been tabulated for four levels of significance. An important addition to this set is the table of distribution of Variance Ratio for 4 levels of significance, *i.e.*, 20, 5, 1, 0·1 per cents. This form of the table will be

very useful for comparing variances. The Latin Squares and the available Combinatorial Solutions of Balanced Incomplete Blocks given in Tables XV–XVII will help the agricultural experimenter in designing his lay-out for an experiment according to recent developments in Field Plot Technique.

The method of polynomial fitting for examining secular changes and for correlating residuals in "time-series", has been used in the past very sparingly by workers because of the arithmetical labour involved, but the values of Orthogonal Polynomials up to $n = 52$ given in Table XXIII will greatly facilitate the computation of the distribution constants up to the 5th degree. Research workers, especially in Agriculture, Meteorology and Economics, who have to deal with distribution of variables in time will find that much labour is saved by the use of these tables. Data in which only the order of the magnitude is available or reliable, can be analysed with the help of the scores for ranked data given in Table XX.

The introduction to the tables commends itself by its brevity and clearness and contains a number of worked out examples for guidance in the use of the tables. The accuracy of interpolated values for the various tables has been discussed in the last section of the "Introduction".

Apart from the special statistical tables a few of which have been mentioned above, some tables of standard functions of general utility such as logarithms, square roots, trigonometric functions, etc., are also included. Tables of random numbers and constants of weights, measures, etc., increase the usefulness of the volume still further.

The arrangement of matter, the printing and the get-up of the book are excellent, and it is sure to be invaluable to the increasing number of statistical workers in India.

V. SATAKOPAN.

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**Organic Synthesis. Vol. XVIII.** Editor: R. C. Fuson. (John Wiley & Sons, Inc., New York; Chapman & Hall, Limited, London), 1938. Pp. v + 103; 1 Fig. Price $1·5.

The current volume of this valuable series contains explicit directions for the preparation of twenty-nine substances of different types among which are allylamine, barbituric acid, taurine, α-hydrindone, *l*-histidine-monohydrochloride, ethylbenzoyl-acetate, 4 : 4'-difluorobiphenyl, potassium-anthraquinone-α-sulphonate, and 2-acetothienone. A convenient method for making malonic acid, and for methyl iodide from methyl sulphate in excellent yields are described. There follows an appendix containing references helpful for 34 preparations in previous volumes along with additions, and corrections. The details are sufficiently exhaustive in some cases as to reduce the work to almost mechanical routine and the book should be very helpful to those who may actually need these substances for any purpose.

B. S. R.

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**Insects of Citrus and Other Subtropical Fruits.** By Henry J. Quayle. (Comstock Publishing Co., New York), 1938. Pp. 583. Price $5·00.

This book treats of a wide variety of insects of great economic importance to fruit culture specially in the subtropical regions of the world. To the horticulturists and the horticultural entomologist in particular, constantly faced with very serious problems of insect predominence in the various stages of the growth of fruit plants, the exhaustive manner in which the numerous insect enemies are dealt with, will be found to be of immense interest and benefit.

The major insect and acarine enemies of citrus dealt with in the first four chapters, include detailed observations from the taxonomical, biological and ecological viewpoints, a combination that thoroughly clarifies the situation and leaves little else to be desired by the entomologist in the capacity of a consultant and guide. As the expansion of the citrus fruit industry in the tropical and subtropical countries depend very largely on the efficient control of a large variety of serious insect pests attacking the plants, orchardists have good reason to be grateful to the author who has furnished practical and efficacious methods based on scientific observations.

In addition, the insects attacking fruits like grape, fig, Avocado, almond and pomegranate are also described in a detailed manner.

The rodents, nematodes and snails that take their own toll from the fruit plants are discussed at length in a separate chapter. The damage caused by these animals,

however, does not amount to much; nevertheless, they are also to be controlled in time by the fruit growers.

The most important operations of fumigation, spraying and dusting that form necessary adjuncts to fruit culture on a large scale have been described very thoroughly. The resistance of certain varieties of scale insects (Coccids) to the deadly fumes of HCN and the gradual immunity developed by some others, furnish clear proof of the extraordinary structure and the wonderful plasticity of the insect system and give an insight into the toughness of the problem of control of certain classes of insect pests.

Bibliographical references, illustrative charts and graphs, tables of meteorological data and above all—the beautiful reproductions of photographs and line drawings, all abound in the pages of the book making it a very comprehensive and attractive treatise.

B. K. M.

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**A Manual of Foundry Practice.** By J. Laing and R. T. Rolfe. Second Edition. (Chapmann & Hall, Ltd., London), 1938. Pp. 312. Price 18/-.

Methods followed in the modern foundry practice in Britain have been clearly explained in this volume and some examples are cited to illustrate the principal details of moulding, core-making, pattern shop equipment and moulding tackle. One chapter is devoted to the metallurgy of cast iron. A brief reference is made to chilled iron castings and malleable cast iron both whiteheart and blackheart. Cupola mixture calculations for British Foundry pig irons and the results of mechanical tests on the resultant irons have been tabulated for several important castings; graphs are also given showing the effects of different constituents in cast iron on its tensile strengths.

Modern developments in melting furnaces such as balanced blast cupola, air furnaces and rotary furnaces have been clearly explained. One of the chief advantages of the rotary furnaces is the feasibility of close control of composition, specially with low total carbon contents, which cannot be easily obtained in ordinary cupola melting practice.

In the last chapter non-ferrous castings are dealt with; methods of producing gun-metal, manganese, bronze and aluminium castings have been explained with examples, and practical tips are given in alloying and melting of aluminium castings.

The author has not touched upon either the production of steel castings or centrifugal and die castings; with an additional chapter on this important branch of foundry practice, the value of this work would be materially enhanced.

B. R.

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**Applied Mycology and Bacteriology.** By L. D. Galloway and R. Burgess. (Leonard Hill Limited, London), 1937. Pp. 186. Price 10s.

A knowledge of the main principles of Mycology and Bacteriology is almost essential to an appreciation of the progress made in many of the industrial processes with their increasing dependence on the activities of micro-organisms. To an industrial engineer and chemist without much of a biological background such knowledge is often most necessary. A book devoid of the special terminology of these sciences and for readers of this class, however, has been overdue and Galloway and Burgess have endeavoured to write just such a book. The book is not without interest to the students of Mycology and Bacteriology who will find much in it that they did not know and a good deal to clarify their ideas.

Of the fourteen chapters of the book, the first eight are taken up by general considerations on micro-organisms, the apparatus needed for their study, methods of isolating, examining, culturing and staining them and description of structure, energy requirements and metabolism. In the next five chapters their employment in the food, fermentation and textile industries and the important part which micro-organisms play in hygiene, medicine and agriculture are clearly set forth.

How the authors could compress into about 186 pages so much useful information about fungi and bacteria without ignoring any important phase of their activity is indeed most remarkable. The book is neatly printed, and errors are very few. It is written in an elegant style and the book should appeal even to lay readers of an inquisitive disposition.

B. B. M.

**A Laboratory Guide for a Course in General Botany.** By Lee Bonar, Lucile Roush and Richard M. Holman. (John Wiley & Sons, New York; and Chapman & Hall, Ltd., London), 1938. Pp. 110. Price 6*s*. net.

This laboratory guide is compiled by three members of the Botanical Staff of the University of California and gives a detailed curriculum of practical exercises in an elementary course in General Botany, covering a period of one year.

In Part I are given practical exercises on the structure and function of seed-bearing plants and in Part II on the types of principal groups of plants. To each chapter is appended a large number of questions which should acquaint the student well with the whys and wherefores of what he does. It may be noted that practical exercises in the morphology and physiology of every plant organ are included together in the same chapter, thus keeping in mind the essential unity of form and function.

While teachers in Indian Universities must necessarily frame their own curricula for practical work, suited to their laboratory facilities and examination requirements, this 'guide' may prove useful in suggesting a good background to start with.

R. D. A.

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**Das Aufbauprinzip Der Technik.** By Paul Wessel. (Verlag von Ernst Reinhardt, Munchen), 1937. Pp. 39.

The author states and explains in a simple way such broad principles of technological development as organisation, selection of materials, design, research, etc. To illustrate the application of these principles he assumes for a while that all the material wealth of the present civilization to be lost leaving only what bare nature offers and then proceeds to show the possible way of getting back the lost wealth starting with the production of crude forms of simple appliances such as surface block, straight edge, callipers, gear wheel, etc. The reader is thus made to realise the various factors upon which depends the manufacture of instruments and apparatus. This pamphlet of about 40 pages presents an interesting reading showing us how Technology has reached its present advanced state starting with very primitive conditions.

K. C.

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**La Duree Extreme de la vie Humaine.** By E. J. Gumbel. (Herman et Cie, Paris.) Pp. 63. Price 18 *francs*.

This book deals with the problem of determining the extreme duration of human life by the study of a mortality table. It is well known that the mortality tables cannot give valid results in advanced ages. Uptil now the books dealing with this subject introduce a discontinuity in order to avoid this difficulty. But as Steffenson has remarked this raises logical difficulties. The author avoids this difficulty by treating the corresponding biometric function as continuous at the same time assuming that it will approach zero in some asymptotic way.

K. V. I.

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**La Ultra-Convergence dans les series de Taylor.** (*Actualites Scientifiques et Industrielles.*) By G. Bourion. (Herman & Co., Paris.) Pp. 46. Price 12 *francs*.

The first systematic investigation of the over-convergence of Taylor's series is by Ostrowski in 1921. Earlier to him Porter and Jentsch had given examples which possessed the over-convergence property, *viz*., there existed a sequence of partial sums of the Taylor-development which converged uniformly in a region *greater* than the circle of convergence. The present monograph is a systematic and methodical presentation of the subject as developed till the present day. This book contains full proofs of the theorems of Ostrowski, Losch, Carlson etc., on over-convergence, the uniformity of distribution of the zeros of the partial sums of any Taylor series which is not lacunary. Only a very elementary knowledge of the theory of functions enables one to work through the book—the only advanced theorem assumed is the fundamental theorem of potential theory which is required only for understanding the theorems in their complete generality.

The book is a very great improvement on the two earlier books which treat this subject, *viz*., *Bieberbach-Lehrbuch der Funktioner Theorie*, Bd. II and Dienes-Taylor Series.

K. V. I.

**Analogies entre les Principes de Carnot, Mayer et Curie.** par Paul Renaud. (No. 516 of Actualites Scientifiques et Industrielles, Hermann et Cie, Paris), 1937. Pp. 47. Price 10 *fr.*

The author considers the first and second laws of thermodynamics as disguised definitions based on a strict validity of causality, but having the power of correlating a number of experimental results and therefore of practical utility in certain fields. He exhibits the analogy between these principles and a generalization of Curie's principle which is stated as follows: "If an assemblage of causes is invariant with respect to any transformation, the assemblage of effects must also be invariant with respect to the same transformation". This principle is also shown to be a disguised definition and examples are considered to show how the first and second laws of thermodynamics may be derived from the generalization of Curie's principle. The reasoning is acute and throws an interesting light on these principles.

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**La Structure des Corps Solides dans la Physique Moderne.** par Leon Brillouin. (Actualites Scientifiques et Industrilles, No. 549; Hermann et Cie, Paris), 1937. Pp. 55. Price 18 *fr.*

In this brochure Prof. Brillouin gives an illuminating account of some phases of the development of the theory of the solid state, including particularly the theory of elasticity. In connection with the restrictions imposed by wave mechanics on the applicability of Born's lattice theory a beautiful description of the wave mechanical model of the atom in various spectroscopic states is included. The author's own theory based on a modification of Debye's ideas is just outlined at the end. There can be no hesitation in saying that, in accordance with his object in writing the pamphlet, Prof. Brillouin has eminently succeeded in arousing our interest in a widening field of research so well illumined by his own labours.

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**Spectrographie de Masse: Les Isotopes et leurs Masses.** By Louis Cartan. (Actualites Scientifiques et Industrielles, No. 550; Hermann et Cie, Paris), 1937. Pp. 91. Price 20 *fr.*

This is a lucid account of the conditions to be fulfilled by a mass spectrograph in order to attain good focussing and high resolution, and the ingenious ways in which the instruments of Aston, Bainbridge, Dempster, Mattauch, Nier, and others, have been constructed so as to achieve these results. The mathematical analysis leading to a discovery of these conditions is not included. It is written by one who has a good deal of practical experience in the subject and the information contained represents what is essential for successful work. The results so far obtained have been discussed and tabulated. The latest figures given by Aston and Dempster and reported in *Current Science* modify but slightly the values recorded in the brochure. It may be recommended to all desirous of acquiring a critical knowledge of the theory and practice of mass-spectroscopy.

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**La Polonium.** By M. Haissinsky (Actualites Scientifiques et Industrielles, No. 517; Hermann et Cie, Paris), 1937. Pp. 44. Price 12 *fr.*

Here we have an account of the preparation and properties of Polonium. The electrochemistry of the element is treated at length. One can here understand and admire the ingenuity expended in determining the properties of a substance available in such small quantities. The pamphlet is a valuable addition to the literature of the subject.

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**Regions ionisées de Haute Atmosphère.** By R. Rivault. (Actualites Scientifiques et Industrilles, No. 547; Hermann et Cie, Paris), 1937. Pp. 91. Price 20 *fr.*

The author here describes the results obtained by him during the course of a long investigation regarding the propagation of short electromagnetic waves (41·5 and 74 metres). The method employed was novel in that an object of the form $\dashv <$ was televised, and the multiple displaced images due to the direct waves and those reflected at the various ionised layers of the atmosphere were recorded on a moving photographic film. A study of these displacements has led to a number of interesting results which are here set forth in detail. The author could not get any indication of the reflected waves when the receiver was less than about 3 km. from the sender. On the other hand, he has also found images due to multiple reflections from the same layer. Apart from confirming

some results due to previous workers, the author has thus observed some new phenomena. Another of these is the redoubling of each of the ordinary and extraordinary waves. The method employed had also the advantage of allowing the phases of the several waves to be determined. We congratulate the publishers on making these results available in this form to a larger public.

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**Physical Geography for Indian Students.** By Dr. C. S. Fox. (Macmillan & Co., Ltd., London), 1938. Pp. 1–544. Price Rs. 5.

We are glad to welcome this book by Dr. C. S. Fox of the Geological Survey of India on "Physical Geography for Indian Students". This is a completely revised and enlarged edition of Simmons and Stenhouse's Class-book of Physical Geography adapted particularly to meet the requirements of Indian schools and colleges. The book is divided into three parts—Part I dealing with map-making and astronomical geography, Part II with land and sea, and Part III with climate. In the first part, the author gives an elaborate account of the different kinds of Maps, together with an explanation of the broad principles involved in map-drawing and projection. In Part II, we have first a general account of the nature and distribution of land and sea areas, and then, a full description of the work done on the earth's surface by various dynamical agents, such as rivers, glaciers, lakes, volcanoes and earthquakes. This naturally leads on to a consideration of the origin of rock masses, and the part played by their structure and denudation in determining the topography of a country, thus revealing the intimate relationship between underground geological structure and surface physical geography. Part III is devoted to the study of climate in all its aspects, especially in influencing the geographical distribution of plants and animals, including Man.

The treatment of the subject-matter throughout the book is eminently practical. At the beginning of each chapter are suggested a few simple experiments with a view to make the student an independent observer, and develop in him a capacity to interpret intelligently the phenomena he observes, and their bearing on the subject under consideration; at the end of each chapter again, are given a series of exercises which will enable the student to find out for himself how much of the contents of the chapter he has just read, he has been able to clearly understand and appreciate. The text is packed with a lot of useful information not only on physical geography, but also on several other allied subjects such as astronomy, geology, meteorology and physics, and is profusely illustrated with examples, diagrams and sketches, mostly from India, some of which are of more than usual interest. By his wide and intimate knowledge of the country about which he is writing and aided by the remarkable lucidity of his exposition, Dr. Fox has succeeded in writing a really popular textbook of Physical Geography for Indian students; and we have no doubt that this valuable service he has rendered to the cause of geographical studies in India, will be widely appreciated.

L. Rama Rao.

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**Annales Bryologicii, Vol. IX.** Edited by Fr. Verdoorn. (Chronica Botanica Co., Leiden, Holland), May 1937.

Recent taxonomic studies have shown that Taxonomic Bryology is not so sound as it seemed to be. The necessity of critical revision of certain groups and large genera is being felt very keenly. It is gratifying to note that Dr. Fr. Verdoorn (Editor: *Annales Bryologicii*) has been able to secure the co-operation of a number of authors to undertake such revision. A number of such articles is a special feature of this volume. Chalaud's article points out a new line of work. Bryophyta Nova section should be enlarged. It would add to the value of the section if the editor manages to secure the co-operation of more Taxonomic Bryologists. The authors should also make it a point to publish a new species in this section and not in the journal with a limited local circulation. When new species are described during the course of a year in international journals reference to these may be given at the end of this section. It is needless to point out that "Reviews of Recent Researches" and "Miscellaneous Notes" section are very useful. Considering all these points one can safely assert that a set of *Annales Bryologicii* should be within easy reach of every worker in the domain of Bryology.

R. S. Chopra.

**Recherches Sur la Théorie Cinétique Des Liquides—I. Fluctuations en Densité; and II. La Propagation et la Diffusion de la Lumiére. par J. Yvon. (Actualités Scientifiques et Industrielles, Nos. 542 and 543, Exposés, Théories Méchaniques.) (Hermann et Cie, Paris), 1937. Price 18 *fr.* each.**

The present numbers of the series deal with the theoretical study of the scattering of light in liquids without change of wavelength. It is well-known that the problem of the scattering or the diffusion of light in liquids is directly connected with their internal structure. Assuming a complex structure the author has derived an expression for the intensity of scattering in a monoatomic liquid like liquid argon. The classical treatment has been adopted and the rôle of thermal agitation in the fine structure of the light diffused has been neglected. The experimental verification of the formula obtained by the author for the intensity of scattering serves as a criterion to the structure adopted by him for the liquid. Unfortunately experimental data are lacking in the case of monoatomic liquids. Unless the treatment is extended to the case of more complex molecules it will remain as a mathematical curiosity. This brochure is well worth a close study by those interested in the general question of the structure of liquids.

R. S. K.

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**The Plant Diseases of Great Britain. By C. G. Ainsworth. (Chapman & Hall, Ltd., London), 1937. Pp. 273. Price 15*s.***

This book is mainly a collection of the key references for the principal diseases of plants in Great Britain; and is of considerable help to plant pathologists. The valuable information given in the notes under the references in this book and the reference to abstracts, in the *Review of Applied Mycology*, of papers in foreign languages will be greatly appreciated by every worker in this field. As pointed out by Dr. E. J. Butler, in the Foreword, this list provides information about plant diseases in Great Britain, that might cause damage if introduced. If every country publishes its list, it will meet an international need.

M. J. N.

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**An Atlas of Indian History. By E. W. Green, B.A. (Oxon.). (Macmillan & Co., Ltd., London), 1937. Pp. 43. Price Rs. 2.**

Undoubtedly the *Atlas* prepared by Mr. E. W. Green must be indispensable to teachers of Indian History in the secondary schools and, we would venture to suggest, must be found an invaluable aid even in the collegiate classes. The new methods of teaching the high school subjects insist on a close correlation being established for a proper and rational appreciation of their contents, and without the assistance of maps depicting the rise, growth and decay of ancient kingdoms, the great historical movements and events will not have delivered their message to the pupils. The *Atlas* contains twenty beautifully coloured maps, with short explanatory notes, and between them is a condensed summary of the historical vicissitudes of India from the earliest times (6000–2500 B.C. to 1858–1930 A.D.) to the present day. No student of the high school classes, or for the matter of that of the intermediate colleges can follow the lectures in Indian History without an atlas of this kind.

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**A Text-Book of General Botany for Colleges and Universities. By Richard M. Holman and W. W. Robbins. Fourth Edition. (John Wiley & Sons, Inc., New York; Chapman & Hall, Ltd., London), 1938. Pp. xvii + 664. Price 20*s.* net.**

The first edition of this well-known textbook appeared in 1924 and now this is the fourth—which speaks in itself for the favourable reception it has received from both teachers and students. The senior author, Dr. Holman, died soon after the publication of the third edition in 1934.

The morphological part of the book is thoroughly satisfactory. The illustrations are however remarkably unequal. Most of them are excellent; some are amateurish but sufficient for the purpose; others are so poor that they should never have been included in a book of such quality. This defect seems to be due to the fact that the authors utilised the services of students or inexperienced draughtsmen for making some of the drawings.

Of the types used in Part II, we think that wheat and corn are not suitable for a study of the development of the embryo-sac and endosperm, since the number of

antipodal cells is abnormally large in both cases.

The chapter on Mendelism seems out of date and portions of physiology need further improvement.

On the whole, the book is very suitable for elementary students. It is to be hoped that the publishers will try to bring down the price to a more reasonable figure.

P. MAHESHWARI.

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**The Soils of Palestine.** By A. Reiferberg. Translated by C. L. Whittles. (Thomas Murby & Co., London.) Pp. viii + 131. Price 14*s*. net.

This monograph dealing with the soil formation in Palestine, is a valuable addition to the existing literature on the evolution of soils and their classification. It is a record of extended researches of the author on the soils of Palestine.

The subject is dealt with in five chapters, the first three devoted to the study of soils in Palestine and the other two to the application of the results of such a study to the advancement of agriculture after the Zionist colonisation.

The author narrates in a lucid manner the general characteristics of the soils and their evolution as influenced by the Mediterranean climate. Special mention has been made of the critical study on the "Terra rossa" soils. After reviewing the prevailing theories on its evolution the author postulates a new one based on the chemical and colloid-chemical reactions taking place under the Mediterranean climate. Evidence has been presented to show the dominating influence of climate on the evolution of soil types. The treatment of the subject is extremely methodical and the arguments based on accumulated evidence are very convincing.

The bearing of climate on the changes in parent material culminating in the formation of colloid fractions possessing specific base exchange properties and definite H-ion concentrations has been discussed. The necessity for a detailed study of the colloid fractions from the various climatic regions as a means of understanding their origin has been stressed.

The last two chapters which are of special value to the Palestine agriculturists, are not without interest to the Pedologists elsewhere. Particular attention has been drawn to the importance of selection of soil for citrus culture, the quality of irrigation water and the tolerance limit of citrus plants to chloride. Incidentally, the changes that are likely to occur in the absorption complex are discussed with reference to the quality of the water and soils in Palestine. The nature of the changes indicated, will serve as cautionary examples for the development of future new projects. The last chapter is devoted to a description of the Zionist colonisation and its influence on the advancement of Palestine agriculture.

C. V. R.

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**Geschichte der Botanik von den ersten Anfängen bis zur Gegenwart.** By M. Möbius, Emeritus Professor of Botany, Frankfurt, Germany. First Edition. (Gustav Fischer, Jena.) Pp. 458. Price RM. 20.

The ordinary University student is usually so busy with the memorisation of facts and figures that he scarcely gets the opportunity of devoting some time to the history of his science and often goes with a very inadequate perspective of the relative value of the results achieved by the numerous investigators, who have contributed their share to the development of the subject.

While there are several good books dealing with the history and growth of the science of chemistry, botanists have not been so fortunate in this respect. Moreover, the few books that we do have on the subject deal only with the events up to the close of the last century and no further. For this reason, the text by Prof. Möbius fulfils a long-felt want and is therefore warmly welcomed. As the author mentions in the Preface, he began his study of Botany in 1880, at a time when nothing was known of Mendelism and the fertilisation of the egg in seed plants was supposed to be caused by some substance diffusing out of the pollen tubes! Having been an eye-witness to the great changes and advances that have taken place through a period of more than 50 years, he is extremely well fitted to write on the subject with confidence and authority.

The arrangement of the material is under the various groups and subgroups of the plant kingdom. Portraits of the principal actors in the drama would have greatly enlivened the interest of the reader, but could not be included since this would

have increased the cost to a prohibitive figure.

No two persons will agree as to what more should have been included in the book and what might reasonably have been omitted or greatly condensed. The late Sir J. C. Bose is the only Indian botanist who has attracted the notice of the author. As is natural, though improper, German workers have been given more prominence than others.

While the book is valuable, it seems that the manuscript was not revised with sufficient care. Several errors and omissions have crept in and a few are of a fairly serious nature. Also one misses that personal touch which the author could easily have given about the lives of at least such of the men with whom he came in contact during his 50 years of botanical activity.

Such criticism, as I have made, is however not inconsistent with an expression of gratitude to Prof. Möbius for the service that he has rendered to botanical science.

P. MAHESHWARI.

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**Text-Book of Organic Chemistry.** By George Holmes Richter. (Chapman & Hall, Limited, London; John Wiley & Sons, Inc., New York), 1938. Pp. viii + 711. Price 20*s*. net.

This book is intended to be a comprehensive introduction to the subject of organic chemistry presented for the needs of the beginning student. No doubt the author has been successful, as it is a well-known fact that many students find organic chemistry a difficult branch on their first acquaintance with it. It should come in helpful in providing a course in the subject though one may be ill-advised to confine reading, to this or any other single text-book as the descriptive and experimental material here has been limited to a minimum and its use will require to be supplemented. The historical background of the science is only briefly referred to, thus greatly diminishing the associated human interest. The author has sought to present the principles and conceptions of organic chemistry in a clear manner in the hope of giving the student a foundation which will enable him to take advantage of his further studies. A very appropriate account of keto-enol tautomerism and unsaturation have been given. Considering the pre-occupation of organic chemists with naturally occurring substances some of the groups have been ably dealt with, while the treatment accorded to colouring matters, terpenes, resins, gums appears somewhat inadequate. A brief reference could have been made to Raman effect, dipole moment, etc., which are becoming so important in organic chemistry. There is no intermingling of aromatic and aliphatic compounds as has been attempted in some recent books. The Geneva system is referred to in the naming of compounds; ketene however should be keten as -ene denotes unsaturated hydrocarbon. A long list of useful review and study questions follow at the end of every chapter, related facts being summarised often in convenient tables. A word of praise is due to the excellent printing and get-up of the publication with few typographical errors. The author has given us a lucid and interesting account of organic chemistry.

B. S. R.

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**The Behaviour of Animals.** (An Introduction to its Study.) By E. S. Russell, D.Sc., F.L.S. (Edward Arnold & Co., London), 1938. Pp. xix + 196. Price 10*s*. 6*d*. net.

The behaviour of animals in their natural homes and surroundings has a perennial interest to man, and any work which deals with this subject in a simple and straightforward way will be welcome to students of natural science and others interested in animals. There must always be scientists who will not rest satisfied with the normal every-day activities of animals in their isolated state or in their communal life, but needs must test and measure their intelligence, plot out graphs and arrive at I. Q. for each animal and then grade up the standards with reference to their cortical development. Experimental studies have undoubtedly a great value in the interpretation of certain tricks which animals can be taught to execute, but they demonstrate the educability, the power of memory, and readiness to reaction on the part of animals which, when caged and presented with an array of observers and their apparatus, cannot be expected to behave normally. What the experimental results indicate must in the first instance be expressions of panic and confusion, and later mechanical repetitions. If the results of public examinations

can be depended upon as furnishing a correct and faithful account of the whole personality of the candidates, then surely we have in the experimental works of psychologists a complete picture of the intellectual life of animals. A knowledge of the behaviour of animals under special conditions, ingeniously devised to confuse them, has its own professional uses, but the knowledge accumulated by game keepers, shepherds, animal breeders, sportsmen and fishermen, unadorned by imaginative glow, must make a stronger appeal and perhaps possess intrinsically greater merit, as being a true record of normal animal life.

This book is a splendid compromise. Experimental biologists will find it both profitable and satisfactory. Students at the threshold of zoological studies will find it most stimulating. Advanced students, wishing for fuller information than is contained in the book, are provided with a bibliography at the end of each chapter. The illustrations, though few, are entertaining. What is most charming about the whole book is the simple and colourful language from which the author does not deviate even when he has to deal with the philosophical aspects of experimental studies. The book is based on the lectures delivered by the author in the Department of Zoology and Comparative Anatomy at University College, London, in 1933, and in their adaptation, they have lost none of the original interest and charm of exposition.

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**Lexicon de stratigraphie, Vol. I, Africa.** Edited by S. H. Haughton. (Thomas Murby & Co., London), 1938. Pp. 432. Price 31*s.* 6*d.*

The Fifteenth International Geological Congress, held in South Africa in 1929, constituted a Committee for the preparation of a stratigraphic lexicon for the whole world, each continent to have a volume. The first fruits of this project is the present volume in handy size, dealing with the Continent of Africa, under the editorship of the Director of the South African Geological Survey, with the collaboration of prominent geologists familiar with different parts of the continent. The considerable amount of geological work which has been accomplished in Africa, especially during the present century, is reflected in this volume. Apparently the whole of the continent is covered except Mozambique and perhaps Rio de Oro.

In this volume the stratigraphic terms in use in Africa are arranged alphabetically irrespective of their geographic restriction. The notes are in English, French, or Italian, as used by the particular collaborator concerned. An extraordinary amount of information on the stratigraphy of Africa is thus made available for the use of geologists all over the world. In the words of the general editor, "As far as possible, each definition incorporates the original status of the term defined, the changes that have taken place in its meaning, the present-day usage, the geological relationships and geographical distribution within the continent of the term defined, a list of the chief fossils characteristic of the unit, and references to the most important literature." The index which occupies 12 pages at the end, has a geographical basis, each political division of the continent being arranged alphabetically. Under each country, the stratigraphic terms in local use are similarly arranged. The usefulness of such a publication for anyone interested in any aspect of African geology—stratigraphic, palæontologic or economic—is evident.

We have in India a similar publication in the *Indian Geological Terminology* by Holland and Tipper, which is familiar to all working geologists. The editor and the 22 collaborators of the volume under review deserve the congratulations and gratitude of all geologists for making this wealth of information of Africa available in a compendious form. The other volumes of this series will be awaited with considerable interest.

The book is well-printed and got-up but appears to be priced too high to become popular with a large circle of users. This aspect, it is hoped, will be remembered by the publishers in bringing out the other volumes of the series.

M. S. K.

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## Spawning of *Hilsa*.*

THE Indian Shad or *Hilsa* has long been favourably regarded as one of the most valuable Indian fish; it is a fish of good appearance and taste, is widely distributed in the Province of Bengal and adjacent waters, is found nearly all the year round and in sufficient quantity to be the occasion of an important fishery.

Consequently it is an object of interest not only to professional zoologists but to the general public as well.

When we consider that its life-history has been wrapped in the mystery we have all the ingredients of a first-calss subject for investigation and this has been clearly recognised by all those who have taken part in the investigation of Indian fish and fisheries since the time of the late Sir. K. G. Gupta.

The *Hilsa* has long been regarded as an anadromous fish, that is, one which moves up the rivers from the sea or estuaries in order to spawn. Until the recent discoveries of Dr. Hora, which are described in the paper under review, practically nothing definite was known of the spawning habits and grounds of the *Hilsa*, though there was naturally much guess-work.

There is a considerable difference in the habits of those anadromous fish whose life-history is well known. Such as the various eels, the salmon, sea-trout, smelt and European Shads.

Even two members of the same family, such as the salmon and smelt are very different in their habits. The salmon goes up rivers as far as ever it can in order to spawn; and smelt on the other hand, spawns at or about the place which is reached by the tide. Having spawned the smelt does not go further up the river.

There are two species of European Shad; the Allice Shad and the Twaite Shad. The Allice Shad goes a long way up the rivers to spawn, in the case of the Rhine as far as Switzerland; the Twaite Shad on the other hand, hardly wanders beyond the tidal influence where it also spawns. We know that the *Hilsa* goes a long way up the Ganges and is caught in the Son as far up as Dehri.

The late Sir K. G. Gupta and the late Dr. B. L. Chaudhuri made extensive tours and inquiries in Bengal in the cold weather of 1906–07 and devoted a lot of time to the *Hilsa*. As a result it was established that while *Hilsa* of marketable size could be obtained at some place or another practically at any time of the year, the young or small fish were practically unknown. Mr. K. C. De in his report on the *Fisheries of Eastern Bengal and Assam*, says: "The *Hilsa* is found in the sea and in all the principal rivers, at practically all times of the year."

The fact that no small *Hilsa* are caught in certain places is no proof they are not there since the meshes of the nets used by the fisherman may be too large to catch such small fish.

Even to-day it would probably be worth while to go over the notes made by Sir K. G. Gupta and Dr. Chaudhuri, but so far as one knows never published (for the period September 1906 to March 1907).

As a rule the fishermen say they have never seen the fry of the *Hilsa*, *e.g.*, at Kalagachia "We have not found any *hilsa* fry in the beels or rivers and I do not know where the *hilsa* spawn" and again at Hooghly "Have never seen *hilsa* ova anywhere or very young fry. *Hilsa* is always caught in deep water along the main current and never in shallow water."

On the other hand, the leading fisherman at Bangoan (Jessore) said, "We catch *hilsa* here in Jaishta and Ashar, but very seldom. We have occasionally seen *hilsa* fry 2" long, coming up in Jaishta and going down in Bhadra."

In spite of investigations made by several scientists no step forward was made until Dr. Hora discovered large numbers of very small *Hilsa*, obviously quite young larvæ, in the Calcutta Corporation Waterworks at Pulta. The results of Dr. Hora's investigations are given in the paper reviewed here.

In view of Dr. Hora's discovery of young fry of *Hilsa* both at Pulta and subsequently at Nawabgunge it is certainly remarkable that previous scientists left Calcutta to wander all over the Province to search unsuccessfully for what has now been found at their very doors. But this discovery does not exclude, as Dr. Hora will be the first to admit, that there may be other spawning grounds of the *Hilsa* further up the rivers and more remote from the sea.

* "A Preliminary Note on the Spawning Grounds and Bionomics of the so-called Indian Shad, *Hilsa ilisha* (Hamilton) in the River Ganges," by Sunder Lal Hora, *Records Indian Museum*, 1938, 40, Pt. II, 147–58.

We know that another Clupeoid, the herring itself, spawns under widely different conditions. The writer has observed the herring spawning in the fresh water of the river Schlei in Schleswig (Germany) and even in an arm cut off from a bay, in which the water has become quite fresh. On the other hand the same species, but may be a different race, spawns in deep and very salt water off the west coast of the British Isles.

As a result of Dr. Hora's discoveries a further question arises. Why does the *Hilsa* migrate up the Ganges as far as Bhagalpur and Monghyr and even up the Son to Dehri? Is this migration for food and is it entirely disassociated from the act of spawning? Or is it essentially a spawning migration?

Is it possible that there are two, or more, races or varieties of *Hilsa*, with different spawning grounds and habits? The fishermen can easily distinguish the male *Hilsa* (called *pait-hilsa* in Eastern Bengal) from the females which they brought to the writer when asked for "Unda-wallahs".

Dr. Hora calls his paper a "Preliminary Note", rightly so in our opinion, since it is to be hoped and expected that we may look for further papers on this most interesting problem, which he has already done so much to elucidate.

Another point to be cleared up is what is really the fish known to the fishermen as *Jatka* or *Jatkya*? According to Mr. K. C. De the *Jatkya* is the smallest of the herring family (*Clupea fimbriata*) and is found in the estuaries as high up as Goalundo from February to April. It is a pretty fish with a rather dark back and silvery sides shot with gold. From the similarity in shape, appearance and taste, the fishermen describe it as the young of the *Hilsa*.

According to Mr. Finlow, "The fingerling of the *Hilsa* has been identified as the *Jatka*, a small fish less than 6" long, found in the Buriganga, Lakhya and Meghna rivers in Eastern Bengal in February–March."

Now that the first and most difficult step has been taken by Dr. Hora in elucidating the mystery of the spawning of the *Hilsa* we await further discoveries in the near future and in particular the eggs and first larval stages.

In conclusion, the reviewer would fail in his duty if he omitted to congratulate Dr. Hora on the appearance of one of the most valuable and interesting, if not *the* most valuable and interesting, paper on Indian fish published for many years.

J. Travis Jenkins.

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# CENTENARIES

S. R. Ranganathan M.A., L.T., F.L.A.
(*University Librarian, Madras*)

## Gregory, James (1638-1675)

JAMES GREGORY, an eminent Scottish mathematician, was born in a parish near Aberdeen in November 1638. The Gregory family had produced many persons who distinguished themselves in science. James was the first and most eminent among them. In the next generation his own son was professor of physics and three of the thirty-two children of his brother David were good mathematicians. James' education began at the grammar school of Aberdeen and was completed at Merischal College. His scientific talent was discovered and encouraged by his elder brother David. From 1664 to 1667 he studied mathematics at Padua.

### His Career

On his return to England in 1668 Gregory was elected a fellow of the Royal Society. Late in the same year he was appointed professor of mathematics in the University of St. Andrews. In 1674 he accepted the mathematics chair of the University of Edinburgh. He was the first "separate professor of mathematics, exclusively devoted to his subject, and not called upon to go through the drudgery of regenting..... (and) only required to give two public lectures a week to such students as wished to attend."

### His Contributions

James Gregory was an inventor of the first order. The reflecting telescope universally employed in the eighteenth century, was first described in his *Optica promota* (1663). His chief mathematical contributions relate to (1) quadrature of circle and hyperbola, (2) use of convergent series to calculate logarithms and to find lengths of

curves, (3) Mercator's chart, (4) solution of the Keplerian problem and (5) geometrical methods for drawing tangents to curves. His brother David strongly urged him to publish his results on quadrature. But he very generously refused to do so on the ground that, as he had been led to it by Newton's discovery, he was bound in honour to wait till Newton should publish his.

*Vera Circuli et hyperbolae quadratura* (1667), *Geometriae pars universalis* (1668) and *Exercitationes geometricae* (1668) were his works.

### His End

Gregory has been described as a man of very acute and penetrating genius, though of an irritable temper. He was devoid of ambition but was keenly sensitive to criticism. One night in October 1675, while showing Jupiter's satellites to his students, he was struck blind by an attack of amaurosis, and died of apoplexy three days later.

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## Becket, William (1684-1738)

WILLIAM BECKET, a British surgeon and antiquary, was born at Abingdon in 1684. He was elected a fellow of the Royal Society in 1718 and read three papers on the *Antiquity of the venereal disease*. He was also an original member of the Society of Antiquaries, which was virtually established in 1717. He was for some years surgeon to St. Thomas's Hospital, Southwork.

His works are : (1) *New discoveries relating to the cure of cancers* (1711–1712); (2) *An enquiry into the antiquity and efficacy of touching for the king's evil* (1722); (3) *Practical Surgery, illustrated and improved, with remarks on the most remarkable cases, cures and discussions in St. Thomas's Hospital* (1740) and (4) *A collection of chirurgical tracts* (1740).

Becket died at Abingdon, November 25, 1738.

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## Herschel, William (1738-1822)

WILLIAM HERSCHEL, a famous European astronomer, was born at Hanover, November 15, 1738. He was a son of a musician. His father brought him up to his own profession with four other of his sons. He came to England sometime between 1757 and 1759 and during this period it is said that his philosophical tastes were so strong that he spent all his pay on a copy of Locke's *On the human understanding*.

### Turns to Mathematics

About 1766 when Herschel was organist of a Chapel at Bath, he "resolved to place all his future enjoyment" in the pursuit of knowledge and turned his attention to mathematics. "After fourteen to sixteen hours' teaching he was won't to unbend his mind with Maclaurin's *Fluxions*. Smith's *Optics* and Fergusson's *Astronomy* were the companions of his pillow and inspired his resolution to take nothing upon trust."

### His Contributions

After two hundred partial failures Herschel made his own telescope of five feet focal length and began his famous observations which have been recorded in the *Philosophical transactions* of the Royal Society in a series of about 69 papers, the first of which was published in 1780 under the title *Astronomical observations on the periodical star in Collo Ceti*. His last paper which was *On the places of* 145 *new double stars*, was published in the first volume of the *Memoirs* of the Astronomical Society (1822). Herschel must be remembered by the number of bodies which he added to the solar system. Including Halley's Comet and the four satellites of Jupiter and five of Saturn, the number previously known was eighteen; to which he added nine, namely Uranus (1781) and six satellites and two satellites to Saturn. His announcement of the motions of binary stars, his discovery of the proper motion of stars (1783) and his speculations on the Milky Way and the constitution of nebulæ first opened the road to other systems in the universe. He was the virtual founder of sidereal science and his only rival in exploring the heavens was his son. He also made telescopes for most of the European Observatories.

### His Absorption in Work

He had his telescope set in his own garden. During intervals of a concert he would run, still in lace ruffles and powder, from the theatre to the workshop. He would polish his mirror continuously for sixteen hours and more. He is stated to have once worked and observed without rest during three days and nights, sleeping at the end for twenty-six hours at a stretch. Miss Burney describes him as "a man

without a wish that has its object in the terrestrial globe, perfectly unassuming (yet) openly happy in his success."

HIS HONOURS

His discovery of Uranus won him the Copley Medal and Fellowship of the Royal Society. It also brought him to the notice of the king who appointed him court astronomer with a salary of £ 200 a year. In 1786 he was elected a fellow of the Royal Society of Gottingen. The King of Poland sent him his portrait. His place became a place of pilgrimage for scientists, princes and grand dukes without number. Academic honours came from many universities and learned bodies. He was created a knight in 1816.

In his eighty-fourth year, Herschel died of bilious fever on August 25, 1822.

## ASTRONOMICAL NOTES.

**Planets during December 1938.**—Venus is a morning star and will be a bright object visible in the eastern sky for about two hours before sunrise. On December 26, it attains greatest brilliancy, the stellar magnitude at the time being — 4·4. Mars is gradually getting brighter and can be seen as a star of the first magnitude, rising about two and a half hours after midnight; it will be in the constellation Libra at the end of the month.

Jupiter will continue to be visible in the western sky in the early part of the night. So also will be Saturn which will be on the meridian at about sunset. On December 15, the planet will be stationary as seen from the earth. The ring ellipse is still nearly edgeways, the dimensions of the major and minor axes being 41·6″ and 5·9″ respectively. Uranus is slowly moving westwards in the constellation Aries and observers with a binocular can easily locate the planet about a degree north of the fifth magnitude star $\sigma$ Arietis. The following close conjunctions of the Moon with planets will occur during the month—on December 5, Uranus; on December 17, Mars; December 18, Venus; and December 20, Mercury.

**Jupiter's Satellites X and XI.**—Since discovery, further observations of the two new satellites of Jupiter have been made at Mount Wilson. From the first five positions obtained, Dr. Paul Herget of Cincinnati has computed two orbits for satellites X, one assuming a retrograde motion for the satellite and the other a direct one. He states that the later observations, however, do not appear to confirm the retrograde orbit. Dr. R. H. Wilson has calculated an orbit (U.A.I. circ 728) with eccentricity 0·14 and period 254·21 days. The elements of the direct orbit are similar to those of the sixth and seventh satellites of Jupiter.

**A Faint Star with Large Proper Motion.**—In the course of the survey for proper motions of faint stars at the Nizamiah Observatory, the star Hyd.ph, — 18°·9743 has been found to have a motion of nearly one and a half seconds of arc per annum. The star is of the twelfth magnitude (photographic scale) and the position (1900·0) is given by R. A. $5^h\ 4^m\ 7^s$, Declination 18°15′·7·S The star is probably a dwarf and one of the nearest neighbours of the Sun.

T. P. B.

## OBITUARY.

### N. G. Majumdar.

WE regret to record the death of Mr. N. G. Majumdar, Superintendent of the Archæological Section of the Indian Museum, under very tragic circumstances. He was murdered by dacoits on the night of 10th November 1938, at Johi, in the district of Dadu, Sind, where he was camping in connection with an explorative survey of the hilly country, northward of Manchur Lake.

Mr. Majumdar was a brilliant graduate of the Calcutta University. After taking his M.A. in 1920, he took up the study of Archæology under Sir John Marshall. He carried out extensive excavations in southern Sind. He was reputed to be one of the best archæologists of India and his untimely death has brought to a close, a very promising career.

# RESEARCH ITEMS.

**Theory of Topological Transformation.**—Dehn (*Acta. Math.*, **B. 69**, pp. 137–206) has made important contributions to the theory of the determination of the group of classes of topological transformation of any 2-dimensional surface into itself. A class of such transformations consists of all those which can be obtained from any one of them by a continuous deformation, *i.e.*, two transformations of the same class can be homotopically transformed into each other. Such problems are already known to be extremely difficult and complicated and hitherto only solutions of some particular problems are known, *e.g.*, a sphere with one hole has only the unit class of transformations. In the case of the anchor ring the group consists of all transformations of the type $\begin{vmatrix} a & b \\ c & d \end{vmatrix}$ where $ad - bc = 1$, $a$, $b$, $c$, $d$ being integers. The central idea of Dehn's work consists firstly in studying the effect of a topological transformation on certain system of curves and associating certain number systems for the curve systems and then studying the effect of the transformation on them. The curve systems which he considers here are essentially distinct from those which come into play in defining the fundamental group. In the former case the curves are free from singularites whereas it is not so for the other. For the latter purpose it is enough if we consider curves passing through a certain point and having a certain direction. The method adopted here seems particularly suited to 2-dimensional manifolds; and the problem of determining the group is reduced to an arithmetical problem. The groups are all shown to be generated by a finite number of elements. Some of the results are given below.

(1) The group of the transformation classes of the anchor ring with one hole is generated by S and T with the defining relation $S^3T^2 = 1$. $\therefore$ it is isomorphic with the fundamental groups of the clover-hoof-knot (*i.e.*, of the outer space of the knot).

(2) For $L_4$, the sphere with four holes, it is the free group with two generating elements.

(3) For the closed surface of deficiency $p$, the group of transformation classes is generated by means of $2p\ (p-1)$ special transformations. These special transformation classes are analogous to the following. Consider $I_2$, *i.e.*, the annular space between two circles $C_i$ and $C_o$. Let I and O be two points on them. Let $I_2$ be joined by two curves $v$ and $v'$ in the region one of which is the straight line, the second is one which does not meet $v'$ except at I and O and where the region formed by $v$ and $v'$ includes the inner circle $C_i$. Then it is easy to give a transformation which is non-homotop with the identical transformation which carries over $v \rightarrow v'$. Such a transformation can be termed as a screw transformation round $C_i$. The special transformations met with are analogous to these.

We await the further progress of Dehn's work with interest. K. V. I.

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**Active Carbon from Bituminous Coal.**—A paper describing the investigation carried out jointly by the Fuel Research organisation of the Department of Scientific and Industrial Research and the Chemical Defence Research Department, into the possibility of producing from lump coal an active carbon suitable for use in gas respirators has recently been issued (H.M. Stationery Office, 1938—Technical Paper No. 47).

During recent years the consumption of active carbon in industry has increased markedly, its main uses being in connection with the purification of solutions and in the recovery of solvents in manufacturing processes such as the production of rubber articles, where solvents are used in large quantities. A large proportion of this carbon is imported, and it was realised that, if a satisfactory means could be found for its production from lump coal, the application of the process would be of benefit to British industry.

The present paper describes the stages in the investigation, which was developed from small-scale experiments to work on a full commercial scale. The results show how at least one type of active carbon of the highest quality can be made, and there is sufficient promise in the preparation of other types to justify further research.

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**Recent Work on Moisture in Wood.**—New ways of using wood as a raw material of industry have shown the need for further knowledge of its fundamental colloidal properties. A recent Report issued by H. M. Stationery Office, London (1938, Price 10 *d.*) deals with the affinity of wood for moisture and the dependence of its strength properties and dimensions on the humidity of the atmosphere. The results of experiments, which are described, are used to build up a rational theory of shrinkage which yields a quantitative connection between the shrinkage or swelling of wood and the swelling pressure acting on the material. As a result, it is shown that the resistance of wood to shrinkage forces is practically identical with its resistance to external loads.

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**Anatomy of *Dermophis*.**—The genus *Dermophis* (Apoda; Amphibia) has a curious distribution; *D. mexicanus* occurring in America and *D. gregorii* in Africa. A comparison of the cranial nerves and blood vessels of the two forms has been made by E. F. J. de Jager (*Anat. Anz.*, **Bd. 86**, p. 321, 1938) with a view to determine the generic status of these two species since it is improbable at first sight that two allied species of the same genus would have such a discontinuous distribution. This comparison has yielded interesting results. The two species so far as their cranial nerves and blood vessels are concerned, reveal very striking similarities and only very inconspicuous differences. The ganglia of the V and VII nerves as well as the nerves themselves show

similarities. The ridge-like branch of Vb present in both, the anastomosis between the chorda tympani and the Vc, are amongst the more interesting points of resemblance. Similarities in the cranial blood vessels are also seen, the most important among which is the presence in the cranio-quadrate passage of a large venous channel formed by V. jugularis interna, the V. capitis lateralis and the cranial branches of the latter.

## The Treatment and Prophylaxis of Malaria.*

### A Comparative Study of Quinine as compared with the Synthetic Drugs Atebrin and Plasmoquine.

A SERIES of experiments in accordance with a uniform programme under the auspices of the League of Nations have been conducted in different countries under varying epidemiological conditions to study the comparative value of quinine as against Atebrin and Plasmoquine. The study included the relative value of these three drugs in respect of (1) primary infection, (2) gametocytes, (3) acute clinical symptoms, (4) frequency of relapses, (5) splenomegaly and prophylaxis. The tests on prophylaxis included (1) a daily administration of a prophylactic dose of quinine or atebrin to the entire population of an antimalarious district throughout the effective transmission season; (2) the systematic treatment with either one or other of the drugs alone or in combination with plasmoquine of all clinical cases of malaria whether primary or relapses detected during the season; and (3) medical and microbiological observations of the above groups and of a control group until the following transmission season.

As a result of these experiments one of the important observations made is that the differences existing between the strains of parasites, prevent the drawing of uniform conclusions. But still from the available evidence it is possible to state that quinine in mean daily doses of 1 gm. for five to seven days compares quite favourably with atebrin, though the action of atebrin is slightly more rapid and more lasting on the trophozoites of *P. vivax* and *P. malariæ*. The atebrin-treated cases have fewer relapses than the quinine group though the yellow colouration produced by atebrin is a definite disadvantage.

The selective anti-gametocidal action of plasmoquine against the gametocytes of *P. falciparum* is confirmed and no further evidence is available to justify its therapeutic use.

In combination, the value of quinine and atebrin is still doubtful, but quinine and plasmoquine offers distinct advantages in having fewer and less intense toxic symptoms as also being found most efficacious in the treatment of benign, tertian and quarten malaria.

It is noted that while the possible toxic effects of the synthetic drugs have been studied in detail, the question of the behaviour of quinine under similar conditions has not received the same attention. The slow elimination of atebrin is confirmed and the experiments of Field, Niven and Hodgkin further show that the quantity of atebrin held in the system after the third week, after the cessation of prophylactic treatment (in weekly doses of 0·40 gm.) was too low to prevent the occurrence of relapses.

Further work on the dosage and form of treatment and administration of atebrin and plasmoquine to children in any scheme for mass treatment, is called forth in view of the statement in the League report that these questions cannot be regarded as finally settled.

In the doses used as a prophylactic (0·1 to 0·40 gm. of quinine daily as against 25 mg. every two days to 5 cg. every day of atebrin), it is reported that quinine was more effective than atebrin as the reduction in the spleen and parasite rates in the quinine group was effected more quickly and maintained for a longer time. But attention has to be drawn to the fact that while the quinine group received 2/5 of the usual curative dose, the atebrin group got only 1/6 of the daily curative dose and that atebrin was administered only once in two days as against quinine which was given daily. With equivalent quantities the results might have been very different. In the case of plasmoquine it is felt that except under strict medical control, the drug is still dangerous for use as a mass prophylactic.

As regards the rôle of synthetic drugs in regard to black water fever, it is stated that the action of atebrin in influencing the onset of black water fever is probably the same as that of quinine.

B. ANANTHASWAMY RAO.

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* *Fourth General Report of the Malaria Commission*, "Study of Synthetic Drugs as compared with Quinine, in the Therapeutics and Prophylaxis of Malaria."

*League of Nations Bulletin of the Health Organisation*, October 1937—"Comparative Experiments in Mass Prophylaxis of Malaria by means of Quinine and of Synthetic Drugs (Quinacrine and Præquine)" by L. Parrot, A. Catanei and R. Ambialet with the co-operation of J. Glastrier.

*Prevention and Treatment of Malaria by Synthetic Drugs* (Field Experiments) by Dr. E. Mosna and Dr. A. Cannalis under the direction of Professor G. Bastianelli.

# SCIENCE NOTES.

**Chemical Investigation of the Seeds of *Swietenia Mahagoni*.**—Dr. S. V. Shaw and Mr. D. G. Pishawikar, Department of Chemistry, Rajaram College, Kolhapur, write under date September 25, 1938 :—

The fruits for this investigation were obtained from a few trees planted in the local Town Hall gardens. The tree growing to a height of 45 feet appears to be *Swietenia Mahagoni* which is not indigenous to India but is stated to grow abundantly in West Indies and Central America. Each fruit yields 55–60 seeds which are winged at the top and brown in colour. The upper soft fleshy cover of the seeds was removed and the seeds were extracted with petroleum ether. A white substance observed in the petrol solution remained dissolved in the oil after removal of the petroleum ether and the *yellow oil* obtained had an unpleasant and bitter taste. The table below gives the analytical data for the oil side by side with the values quoted by Lewkowitsch and Warburton (*Chemical Technology and Analysis of Oils, Fats and Waxes*, 1922, **2**, 147) for a sample received at the Imperial Institute from Barbados. The latter is described to be a *dark greenish oil* having an unpleasant bitter taste and exhibiting weak drying properties.

| | Authors | Lewkowitsch |
|---|---|---|
| Yield (calc. on weight of seeds) .. .. | 50 per cent. | |
| $d^{27\cdot5}_{27\cdot5}$ .. .. | 0·9179 | $d^{15\cdot5}_{15\cdot5}$ 0·935 |
| $n^{25}$ .. .. .. | 1·4720 | |
| Acid value .. .. | 1·25 | 13·0 |
| Saponification value .. | 201·3 | 193·3 |
| Acetyl value .. .. | 21·8 | |
| Reichert-Meisel value .. | 2·30 | 1·9 |
| Polenski number .. | 0·35 | |
| Iodine value .. .. | 94·4 | 125·0 |
| Unsaponifiable matter .. | 1·8 | |
| Titre test .. .. | .. | 30·5 |

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**Fungi of India.**—A supplement to Butler and Bisby's *Fungi of India*, recording more than 500 new fungi which have been discovered and described since 1930 by mycological workers in India, has recently been issued (B. B. Mundkur : Scientific Monograph No. 12, The Imperial Council of Agricultural Research ; Manager of Publications, New Delhi, 1938 ; Pp. 54 ; Price Re. 1–6–0 or 2*s.* 3*d.*). There has been an increasing amount of activity in this field, thanks to the participation of many of the Indian Universities. Dr. Mundkur's book is a valuable record of reference whose usefulness would have been greatly enhanced if it had been possible to mention the source of supply for each of the cultures recorded.

Fungi have great economic importance and the potentialities of their employment in industry have not been explored in India. It is imperative that a National Collection of Type Cultures, should be organised as a first step in stimulating intensive research in industrial mycology. Dr. Mundkur's volume is helpful in inviting attention to the wealth of mycological material in which the country abounds, and to the necessity for maintaining a national collection of cultures as already suggested in *Current Science* for May 1938 (Vol. **6**, No. 11). M. S.

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The Recent Government Report on the **Quetta Earthquake of 31st May 1935** by Captain L. A. G. Pinhey, Additional Political Agent, Quetta, gives an authoritative and complete account of the action taken by the authorities immediately after the earthquake, for relieving the distress and suffering of the survivors, and later, towards the gradual reconstruction and repopulation of the City of Quetta. Among the major problems which one has to face immediately after a disastrous earthquake of the kind which occurred in Quetta, we may mention the rescue of those who are buried under the debris and are still alive, the establishing of communications with the outside world, the provision of shelter, food and medical attention to the survivors, and the preventing of looting by irresponsible people in the affected area. The Report under review gives an account of the work done in these and several other directions, and bears eloquent testimony to the remarkably expeditious and efficient manner in which the different relief operations were organised and conducted. The detailed information given in each case of how exactly the authorities tackled their problems and went about organising this relief work will, we have no doubt, be of great value some day when one may be called upon to deal with a similar situation elsewhere.

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**Researches at Rothamsted.**—There is probably no other science which bristles with so many controversial differences of opinion as agriculture. This is undoubtedly due to the very large number of variable factors which go to raise a crop ; and the unravelling and discernment of the individual effect due to any single factor is possible, in several cases, only by exhaustive statistical analysis of systematic data collected over a period of several decades. The value of the data is greatly augmented by the continuity of the original lay-out of the experiment and fidelity of the replications year by year. The unique success of the Rothamsted Experimental Station in achieving this object—especially in their well-known long term experiments—has been mainly due to the relative permanence of its Staff, several of whom have spent decades in the service of the Institute ; and one agrees with the note of caution sounded by the Director in the *Annual Report* of the Station for 1937, which has recently

been published, when he regrets the loss of a number of valuable members of the Staff during the year and observes that " serious consideration should be given to the avoidance of too great a rate of change ".

An interesting feature of the present Report is the prominence given in the opening paragraphs to a discussion of the objectives which an Experimental Station such as Rothamsted should keep in view, in relation to the national agricultural economy of the country in which it is situated. Though the area under arable crops and the total number of workers on land, in England and Wales, have shown considerable decreases within the last 20 years (amounting to about 25%), the total value of agricultural output rose from £141·7 million in 1925 for 803,000 workers to £170·7 million in 1936 for 641,000 workers. This increased efficiency of the farmer and worker has been mainly due to the work of Agricultural Stations in England and Wales—chiefly the one at Rothamsted. The work of this station is winning increased recognition at the hands of Government and public alike, and the present year's developments include the erection of new and bigger laboratories to cope with the increased work in the chemical departments, at a cost of £30,000, of which sum half has been promised by Government.

The Station has already chalked out a tentative scheme for the celebration of its Centenary in 1943 and has set before itself the ambitious programme of giving financial stability to the work of its various departments, by collection of permanent endowments to the tune of £125,000. The unique value of the Station's work is fast making it a National Trust and the appeal will no doubt meet with the same quick response as what greeted the previous one for £60,000 in 1934.

C. N. ACHARYA.

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**London Scientific Film Society.**—*Chemistry and Industry* (October 1st, p. 918) reports the formation of a Scientific Film Society in London. This Society proposes to give a series of shows of good films on scientific themes to its members and their guests in the first instance. To achieve this purpose, the Society will foster the production of films, which will be instructive of the phenomena in scientific research as cannot be otherwise ordinarily be understood and more especially of the interrelation between science and technology and their impact on modern society. An animated cartoon on the operation of the internal combustion engine, another illustrating a mathematical differential equation, a biological film on the paramecium, an engineering film illustrating the boring for oil and a film illustrative of how electrical and other communications have broken down natural barriers, are a few of the representative films included in the programme for the inaugural show in November. The show of films will be accompanied by appropriate lectures.

The Society has been formed on the recommendation of the Special Committee set up by the Association of Scientific Workers to enquire into the prospects of scientific documentary films. This Committee found that the few scientific films produced by the British Film Organisations had a great appeal on the audience.

Professors Sir Frederick Gowland Hopkins, Sir William Bragg and Professor L. Hogben and Julien Huxley are the distinguished patrons of the Society, which has on its rolls already about a hundred and fifty members.

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**Insecticidal Plants.**—The possibilities of cultivation of insecticidal plants in India and the manufacture of vegetable insecticides, are engaging the attention of the Industrial Section of the Botanical Survey of India. There is an increasing demand for insecticides from vegetable sources which are comparatively harmless to human beings, and are for this reason, preferred to the more dangerous arsenical and other chemical preparations. Among such insecticides mention may be made of " Tuba " root of commerce (Derris), Pyrethrum of commerce (*Chrysanthemum Cinerariefolium*) and Tobacco infusion, decoction, nicotine, nicotine sulphate, etc., produced from tobacco waste (*Nicotiana tabacum*). The roots of Derris and flowers of Pyrethrum are considered to be essential proprietory ingredients of insecticides used as dust or spray.

A number of species of Derris grow wild in India. The root of *Derris ferruginea* which occurs in Assam, is rich in Rotenone (nearly 3 per cent.) and shows possibilities for commercial exploitation (see this *Journal*, 1938, **7**, 22). Insecticides prepared from Derris have been tried with success against biting and sucking insects, against caterpillars which damage cabbage crops and against the mango leaf hopper. Attempts to cultivate the " Tuba " of commerce or *Derris elliptica* are being made at the Forest Research Institute, Dehra Dun, and by the agriculture departments of Travancore, Kashmir, Punjab and Mysore. Mysore imported " Tuba " from the Federated Malay States, 4 years ago and grew the plant successfully. Two-year old plants have yielded 5–7 per cent. rotenone.

Pyrethrum has been successfully grown in Murree in the Punjab in experimental plots and its cultivation may be easily extended to other parts of India where the climate and soil are favourable for its growth.

Other Indian plants which are reported to have insecticidal properties are : Kharina (*Milletia pachycarpa*) ; Pilavaram (*Mundulea suberosa*) ; Karanja (*Pongamia glabra*) ; Lashtia (*Tephrosia candida*) ; Neem (*Melia Azadirachta*) ; Madar (*Calotropis procera*). Turmeric (*Curcuma longa*) and *Polygonum flaccidum* and *P. assamicum*.

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**Institute of Plant Industry, Indore.**—Films on silage making, rain-watered compost, municipal compost and improved methods of sugarcane cultivation, have been prepared by the Institute of Plant Industry, Indore, for exhibition with a view to bringing home to the cultivators in the States of Central India and Rajaputana, the results of research and improvements in the science and practice of agriculture. The Institute has on its programme the preparation of films on the eradication of Kans, the working of the Indore Ridger, the standard process of making compost, the drying of cottonseed to prevent pink boll-worm and the making of bone char.

It will be recalled that in the report on the work of the Imperial Council of Agricultural Research (1937), Sir John Russell laid special emphasis on the urgent need for bridging the great gulf separating the Agricultural Experiment Stations and the cultivators. The exhibition of films bearing on improvements in agricultural operations can be of immense help in narrowing down the gap. The work of the Institute of Plant Industry to popularise the results of scientific research is worthy of emulation by other experiment stations.

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**Royal Asiatic Society of Bengal.**—At the ordinary monthly meeting of the Society held on 7th November, Mr. Johan van Manen read a paper on *Recent Exploration in Tibet*. It is of interest from time to time to review the advance of our knowledge concerning Tibet. "In the last decade exploration has been very active. Geographically the work done may be roughly grouped into exploration (1) in the West, mainly around Kashmir, (2) in the South, the great Himalayan peaks, (3) in the East, the Countries West of China, and (4) in Central Tibet, the few visits to Lhasa and other places. The exploration is chiefly of a geological, alpinistic, geographical, botanical, zoological, anthropological, linguistic or historical nature, according to the special interest of the travellers."

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**Scientific Literature : Problems of Co-ordination.**—At the Fourteenth International Conference on Documentation, held at Oxford on September 21–26, a paper on "The Co-ordination of Scientific Literature" was presented by Mr. J. Lewkowitsch.

The problem discussed was the vital present-day need of rendering available to the scientific worker, rapidly, completely, and in classified form, the scientific literature published by other workers. The framework of a complete scheme for the rationalisation of publication, abstracting and co-ordination of the literature was put forward as an ideal towards which to work. The chief suggestions were : (1) That the number of journals published (pure or applied science, or reviews) shall be limited by international agreement of societies and publishers, in regard to scientific recognition. (2) That these journals shall be the only recognised medium for research work, and that other journals shall not be abstracted. (3) That all authors shall prepare their own short abstracts, for the form of which the editors shall be responsible, and that the abstracts shall be sent by the editors to central organisations publishing classified abstracts (*Chemical Age*, October 1, 1938).

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**Col. C. M. Thompson, I.A.,** Director, Survey of India, retired from service on September 21, 1938, on attaining the age of superannuation. Col. Thompson, an officer of versatile qualifications, had extensive experience in all branches of the work of the Survey ; he was a specialist in cadestral Survey, and knew many languages, including some of the Indian languages.

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**The Nobel Prize** for Physics for the year has been awarded to the famous Italian Scientist, Sgr. Eurico Fermi, Professor of Physics, Rome University for "the discovery of new elementary Radio-active substances engendered by the irradiation of Neutron" and other reactions caused by neutrons.

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The Lord President of the Council has appointed **Dr. G. Stafford Whitby,** at present Director of the Division of Chemistry, National Research Council, Canada, and formerly Professor of Chemistry at the McGill University, Montreal, to be the Director of the Chemical Research Laboratory, Teddington, in succession to Sir Gilbert Morgan, F.R.S., who retired on 30th September last.

Dr. Whitby is expected to take up his duties early in 1939.

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**Prof. Karam Narayan Bahl, D.Sc. (Panj.), D.Phil. (Oxon.), F.R.A.S.B., F.N.I.,** Head of the Department of Zoology, University of Lucknow, has been awarded the D.Sc. degree by the University of Oxford, the highest distinction in Science in that University. Prof. Bahl is the first Indian to be so honoured. He is the foremost morphologist in India and holds an eminent position amongst the zoologists. He is the founder of the School of Zoology at the Lucknow University where morphological work has been done in almost every branch of Zoology. He has guided the research work of a number of students, amongst whom as many as seven have secured their doctorates from the University of Lucknow.

The *Indian Zoological Memoirs* series projected and edited by Dr. Bahl have laid the foundations of Indian Zoology and form an important landmark in the development of this branch of science in India.

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The **Noel Deer Gold Medal** for the year 1936, has been awarded to Mr. R. C. Srivastava and Dr. H. D. Sen in consideration of their report relating to large-scale experiments on the Treatment of Sugar Factory Affluents.

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**Mr. K. S. Arnold** has been appointed Professor of Sugar Engineering, Imperial Institute of Sugar Technology, Cawnpore.

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**Dewan Bahadur Dr. A. Lakshmanaswamy Mudaliar,** has been appointed Principal, Medical College, Madras.

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According to a United Press message, the Government of Bihar have decided to employ on salaries ranging from Rs. 250–300 per mensem, four Czechoslovakian Jews, in the Industries Department of the Government.

In a note printed in *Current Science* (1938, 7, 31), the desirability of employing qualified Jews, who have been expelled from Central Europe due to political reasons, was indicated. The above decision of the Government of Bihar is very much to be welcomed.

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**University of Mysore.**

I. *Personnel.*—Mr. J. C. Rollo, M.A., J.P., Principal, Maharaja's College, Mysore, who was granted combined leave, returned from leave and assumed charge of the office of Principal from Mr. A. R. Wadia on the 6th October 1938.

II. *Convocation.*—The Twenty-first Annual Convocation for conferring degrees was held on the 6th October 1938, His Highness the Chancellor, presiding. The Rev. C. F. Andrews delivered the Convocation Address.

III. *Extension Lectures.*—Dr. C. Minakshi, M.A., Ph.D., Madras, delivered a lecture in English at Mysore on "Some South Indian Bronzes" illustrated with lantern slides.

IV. *Deputation to Congress and Conferences.*—(1) Dr. M. H. Krishna, M.A., D.Litt., Professor of History, Maharaja's College, Mysore and Director of Archæological Researches in Mysore, was permitted to attend the Indian History Congress held at Allahabad on the 6th, 7th and 8th October 1938.

(2) Mr. V. Raghavendra Rao, M.A., B.T., Lecturer in History, Maharaja's College, Mysore, was deputed to attend the Historical Week celebrated at Kamshet (Dt. Poona) from the 2nd to the 8th October 1938.

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**Andhra University.**—The Degree of Master of Science Honours has been conferred on (1) Mr. Bhaskararama Murti for his thesis "Chemical Investigations of Indian Medicinal Plants", (2) Mr. V. D. N. Sastri, for his thesis "Study of the reactivity of the double bond in some substituted coumarines and geometrical inversions in acetylated coumaric acids".

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**University of Madras.**—The Degree of Master of Science has been conferred on (Miss) S. Pankajam in consideration of the thesis entitled "On some topics Connected with Boolean Algebra".

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**Outfits for Absorption Spectrophotometry : (Photographic, Visual, Photo-electric).**—Much valuable information can be deduced from the absorption curve of a substance and in modern practice this is an accepted method for many biological assays ; (blood serum, cerebro-spinal fluid, the vitamins, etc.), for the identification and measurement of organic substances, dyes, and other colouring matters of food substances, etc. With the introduction of the spekker ultra-violet spectrophotometer by Adam Hilger, Ltd., the technique of absorption spectrophotometry has been made very convenient, speedy and accurate. A recent pamphlet issued by Messrs. Adam Hilger Ltd., London, describes in a very elegant manner the various outfits placed by this firm on the market for (i) ultra-violet spectrophotometry; (ii) visual spectrophotometry and (iii) photo-electric methods of absorption measurements in the ultra-violet ; the pamphlet also serves as a useful guide to the choice of suitable apparatus for any purpose in view.

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**Diffusion Pumps for the Production of High Vacua.**—We have received a new catalogue of these pumps, of the all-metal type, from Messrs. W. Edwards & Co., the well-known firm of London. Mercury diffusion pumps provide the most satisfactory means of reaching very low pressures and even the smallest sizes have speeds at low pressures much greater than can be obtained by rotary pumps. Furthermore, they are extremely robust, have no moving parts to wear, and can be dismantled for cleaning with a minimum of trouble. The range of diffusion pumps and accessories described in this catalogue, will be found to cover almost all the requirements, from small-scale laboratory work to large-scale industrial processes, where the lowest possible pressures and highest pumping speeds are required. It should prove of interest to physicists, chemists, and works managers, in most industries.

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**Announcements.**

**The Annual Conference of Medical Research Workers in India** will be held in New Delhi from 12 to 17th December, under the auspices of the Indian Research Fund Association.

**International Union of Geodesy and Geophysics.**—The Seventh Meeting of the International Union will be held in Washington, D.C. between 4–16 September, 1939. This will be the first meeting of the Union outside Europe. The meeting will be divided into seven sections, including meteorology. Further details regarding the meeting can be had from Dr. John A. Fleming, General Secretary, American Geophysical Union, Department of Terrestrial Magnetism, 5241, Board Branch Road, N.W. Washington D.C.

**Seventh International Botanical Congress.**—The Seventh International Botanical Congress will be held in Stockholm, Sweden, on July 17-25, 1940.

The Congress will visit the botanical institutions of the University and the Swedish College of Agriculture at Uppsala in addition to several botanical institutions in and near Stockholm. Visits will also be paid to Lund (Botanical Institute) and Goteborg (Gothenburg Botanical Garden).

More detailed information may be obtained from the Secretary, Dr. C. R. Florin, Riksmuseum, Stockholm 50, Sweden.

**The Tenth International Congress of Military Medicine and Pharmacy** will be held in Washington D.C., from May 7–15, 1939. General Charles R. Reynolds, the Surgeon-General of the United States Army, will be the President of the Congress. Further details regarding the Congress can be had from the Secretary-General (Colonel Harold W. Jones), Army Medical Library, 7th Street and Independence Avenue, Southwest Washington, D,C., U,S,A,

**International Acetylene Congress.**—The Thirteenth International Congress of Carbide, Acetylene, Oxy-Acetylene Welding and Allied Industries will be held in Munich, Germany, from June 25 to July 1, 1939. The three preceding congresses were held in Zurich (1930), Rome (1934), and London (1936).

The purpose of the Congress is to promote and discuss all questions of scientific, technical and economic nature which are related to the preparation and uses of calcium carbide, of acetylene, and of the oxy-acetylene process.

Dr. Schmitz, Chairman of the Board of Directors of I.G. Farbenindustrie, will preside at the Congress. Official inquiries should be directed to the Office of the Congress in Berlin-Friedenau, Bennigsenstrasse 25, Berlin, Germany. Lectures and reports should be sent to the Office of the Congress by February 1, 1939.

The Secretary, Central Board of Irrigation, writes:—Waterlogging and Land Reclamation are two of the subjects which have been under consideration by the Board since its institution in 1930 and as there are many problems connected therewith, which still remain unsolved, they will probably continue to be discussed annually by the Board and its research committee. In order to ascertain the present state of knowledge, to compare conditions in various parts of India and to decide what further investigations are necessary and the lines on which they should be undertaken, the Board prepared two questionnaires entitled "Questionnaire on conditions predisposing to harmful soil saturation which may ultimately result in waterlogging" and "Questionnaire on Land Reclamation". These were prepared with the assistance of Dr. E. Mackenzie-Taylor, M.B.E., Director, Punjab Irrigation Research Institute, and his staff and the replies to the questions which they provided, together with those supplied by Officers in other Provinces, were discussed by the Board and its Research Committee at their annual meetings in 1936 and 1937.

At its last annual meeting the Board decided that the questions and final replies accepted by the Board should be printed and published as "Notes on Waterlogging and Land Reclamation in the Form of a Questionnaire".

The Secretary of the Board will be glad to receive further information on any of the problems dealt with in this publication or to provide further detailed information if required.

According to a press communique issued by the **King George Thanksgiving (Anti-Tuberculosis) Fund,** a medical Post-graduate course will be held at the All-India Institute of Hygiene and Public Health, Calcutta, from January 30 to February 25, 1939. No admission or tuition fee will be charged. The course is open to registered medical practitioners whether in Government service or otherwise. There are 30 vacancies for the course. Selected candidates will be paid single II class railway fare, to and from Calcutta, up to a maximum of Rs. 100 per head. Applications in the prescribed form should reach the Secretary before December 10, 1938.

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We acknowledge with thanks the receipt of the following:—

"Agricultural Gazette of New South Wales," Vol. 49, No. 10.
"Journal of Agricultural Research," Vol. 57, Nos. 4–6.
"Monthly Bulletin of Agricultural Science and Practice," Vol. 29, No. 9.
"Agriculture and Live-stock in India," Vol. 8, No. 5.
"The Philippine Agriculturist," Vol. 27, No. 5.
"Journal of the Royal Society of Arts," Vol. 86, Nos. 4479–82.
"Biochemical Journal," Vol. 32, No. 9.
"Biological Reviews," Vol. 13, No. 4.
"Chemical Age," Vol. 39, Nos. 1004–1008.
"Journal of Chemical Physics," Vol. 6, No. 10.
"Berichte der deutschen chemischen Gesellschaft," Vol. 71, No. 10.
"Journal de Chemie Physique," Vol. 34, Nos. 8–9.
"Experiment Station Record," Vol. 79, Nos. 3–4.
"Transactions of the Faraday Society," Vol. 34, No. 210.
"Indian Forester," Vol. 54, No. 11.
"Forschungen und fortschritte," Vol. 14, No. 29.
"Medico-Surgical Suggestions," Vol. 7, No. 10.
"Calcutta Medical Journal," Vol. 34, No. 5.
"Review of Applied Mycology," Vol. 17, Nos. 9–10.
"American Museum of Natural History," Vol. 42, No. 3.
"Nature," Vol. 142, Nos. 3595–99.
"Journal of Nutrition," Vol. 16, No. 4.
"Proceedings of the Royal Society of Edinburgh," Vol. 53, Part 2.
"Research and Progress," Vol. 4, No. 6.
"Canadian Journal of Research," Vol. 16, Nos. 8–9.
"Science Progress," Vol. 33, No. 130.
"Indian Trade Journal," Vol. 131, Nos. 1086–89.
"Indian Journal of Veterinary Science and Animal Husbandry," Vol. 8, Part 3.

**Catalogues.**

"Outfits for Absorption Spectrometry and Spectrographic Outfits." (Adam Hilger Ltd., London, July 1938).
"New Scientific and Technical Books," (Chapman & Hall Ltd., London). Autumn 1938.
"Monthly List of Books" (Weldon and Wesley), September, 1938.
"Diffusion Pumps for the Production of High Vacua" (W. Edward and Co., London).

# ACADEMIES AND SOCIETIES.

## National Academy of Sciences, India :

*August* 1938.—JAGRAJ BEHARI LAL : *Chemical Examination of the Fruits of* Physalis peruviana *or Cape Gooseberry, Part III.* J. DAYAL : *A New Trematode,* Gorgotrema barbius *N. Gen., N. Sp., from a Fresh-Water Fish,* Barbus sarana. M. A. H. SIDDIQUI AND R. V. SINGH : *The Fate of the Duct of Cuvier in Man and Certain Other Mammals.* P. SAMUELS LALL : *Certain Modifications of Dedekind's Theorem of Continuity.* R. D. VIDYARTHI : *New Avian Trematodes (Family Diplostomidæ) from Indian Birds.* A. C. BANERJI AND P. L. BHATNAGAR : *The Solution of Certain Types of Differential Equations.*

*October* 29.—B. P. PANDE : *On Two New Trematodes from Indian Cyprinoid Fishes with Remarks on the Genus* Allocreadium *loos.* B. P. PANDE *A New Strigeid Trematode of the genus* Crassiphiala *V. Haitsma,* 1925 (*Family* : Diplostomidæ Poirier) *from an Indian King-Fisher.* SUKHDEO BIHARI MATHUR : *A Note on the Telescope Method for Determining the Focal-length of Lenses and Mirrors.* K. B. MATHUR AND G. R. TOSHNIWAL : $F_2$*-Region Ionization in June* 1938 *at Allahabad.* JAGAT NARAIN TAYAL AND S. B. DUTT : *Chemical Examination of the Essential Oil of* Ocimum canum *sims.*

## Indian Academy of Sciences:

*October* 1938. SECTION A.—KUNWAR MAHENDRA PRATAP SINGH AND SIKHIBHUSHAN DUTT : *Dyes derived from Chrysoquinone.*—A number of dyes closely analogous to those derived from phenanthrene have been prepared and their properties studied. R. D. DESAI AND M. EKHLAS : *Studies in the Friedel-Crafts Reaction. Part IV.—The Action of Acetyl Chloride and Acetic Anhydride on Resorcinol and its Derivatives. An Evidence for γ-Substitution in the Resorcinol. Nucleus.* VON ALFRED MOESSNER AND A. GLODEN: *Diophantische Probleme.* (THE LATE) N. W. HIRWE, K. N. RANA AND (MISS) K. D. GAVANKAR : *Derivatives of Salicylic Acid. Part XIII.—Chloro-salicylic Acids and Their Methyl Esters.*—Convenient methods have been worked out for the preparation of 3-chlorosalicylic acid, 5-chlorosalicylic acid, 3-5-dichloro-salicylic acid, and their methyl ethers. S. RANGASWAMI AND T. R. SESHADRI : *Nuclear Methylation of Resacetophenone. Preparation of 3-Methylresacetophenone and Its Derivatives.*—With methyl iodide and methyl alcoholic potash, resacetophenone undergoes nuclear methylation in the 3-position and that the hydroxyl group in the fourth position gets esterified. S. RANGASWAMI : *A Fine Adjustment Device for Use with the Micro-Dumas Apparatus.* INDER CHOWLA : *Generalisation of a Theorem of Dickson.* V. R. THIRUVENKATACHAR : *Note on Harmonic Functions.* S. CHOWLA : *A Remark on g (n).* S. MINAKSHI SUNDARAM : *On an Infinite System of Non-linear Integral Equations.*

*October* 1938. SECTION B.—A. RAMAKRISHNA REDDY : *The Development of Anuran Kidney. Part I. The Development of the Mesonephros of* Rhacophorus maculatus, *Boulenger.* N. L. SHARMA : *Felspars from the Pegmatites of Kodarma, Bihar.* RAMDAS MENON : *Two New Species of Pachytroctidæ (Copeognatha) with a Note on the Family.* M. KRISHNA MENON : *The Early Larval Stages of Two Species of* Palæmon. S. M. DAS : *On* Ecteinascidia bombayensis *N.Sp. (A New Ascidian from Bombay).* B. N. SINGH, K. N. LAL AND K. PRASAD : *Photosynthetic Specificity in Relation to Biochemic Constitution of Leaves.* G. N. RANGASWAMI AYYANGAR AND K. KUNHI KRISHNAN NAMBIAR : *A 'Tiny' Sorghum.* G. N. RANGASWAMI AYYANGAR, V. PANDURANGA RAO AND T. VENKATARAMANA REDDY : *The Occurrence and Inheritance of Purple Anthers in Sorghum.* B. N. Singh AND S. PRASAD : *The Effect of Chlorine in Relation to Age upon the Growth and Composition of Wheat.* M. S. RANDHAWA : *Observations on Some Zygnemales from Northern India.—Part II.* V. RANGANATHAN AND B. N. SASTRI : *Digestibilities of the Proteins of Bengal Gram,* Cicer arietinum *Linn.*

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## Society of Biological Chemists, India:

BOMBAY. *30th August* 1938.—A. FERNANDEZ : *The Excretion of Vitamin C in Urine and the State of Saturation in Normal Individuals in Bombay.*

INDORE. *10th September* 1938.—K. A. PATWARDHAN : *The Disposal and Utilisation of Horse Dung and Stable Litter by Composting*; *22nd September* 1938.—S. S. DESHPANDE : *Essential Oil from Flowers of Mendhi and Laboratory Synthesis of Products occur[illegible] in Plants.*

CAWNPORE. *10th September* 1938.—A. N. RAO : *Membrane Permeability.*

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## Errata.

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Column 1, 2nd line from the bottom of 1st para: *for* "nitrate" *read* "nitrite".

Column 2, 2nd para, line 2 : *for* "potassium nitrite" *read* "potassium nitrate".

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1732-38—Printed at The Bangalore Press, Bangalore City, by G. Srinivasa Rao, Superintendent, and Published by B. N. Sastri, M.Sc., A.I.C., A.I.I.Sc., for the "Current Science" Board of Editors, Indian Institute of Science, Hebbal Post, Bangalore.